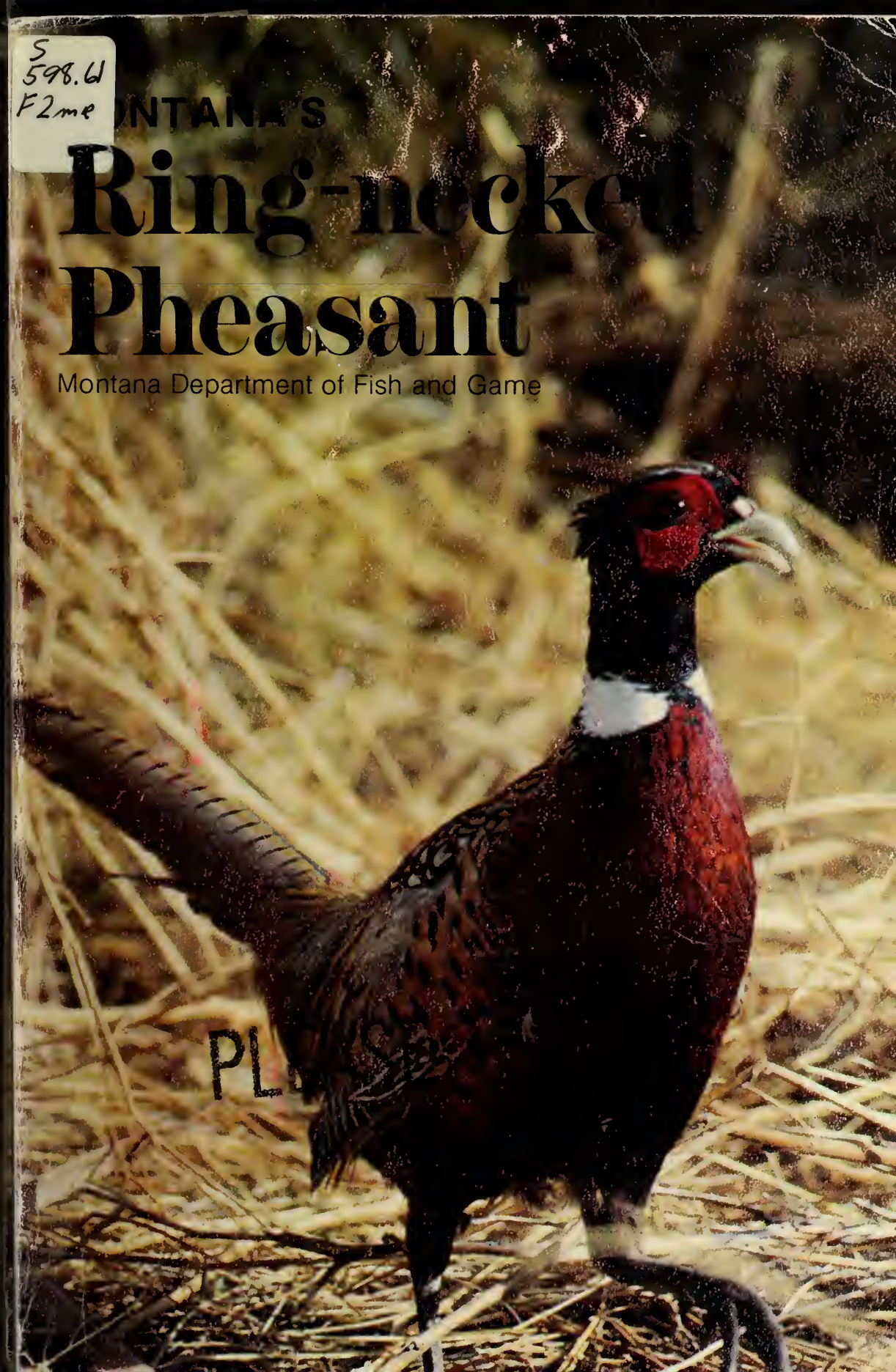
MONTANA'S Ring-necked Pheasant

Montana Department of Fish and Game



MONTANA'S RING-NECKED PHEASANT

History, Ecology and Management

by
John P. Weigand
and
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Game Management Division
MONTANA DEPARTMENT OF FISH AND GAME

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Other Publications by the
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The relation of pheasants to agriculture in the Yellowstone and Big Horn River Valleys of Montana. Robert W. Hiatt. 1947. *Out of print.*

Waterfowl relationships to Greenfields Lake, Teton County, Montana. LeRoy J. Ellig. 1955. *Out of print.*

The pronghorn antelope - its range use and food habits in central Montana with special reference to alfalfa. Glen F. Cole. 1956. (M.S.U. Ag. Exp. Sta. Bull. 516) *Out of print.*

The pronghorn antelope - its range use and food habits in central Montana with special reference to wheat. Glen F. Cole and Bruce T. Wilkins. 1958. *Out of print.*

Merriam's turkeys in southeastern Montana. Robert Jonas. 1966.

Bibliography . . . Wapiti-American elk and European red deer. John B. Kirsch and Kenneth R. Greer, 1968.

Forest grouse and experimental spruce budworm insecticide studies. Thomas W. Mussehl and Phillip Schladweiler. 1969.

People and the Gallatin elk herd. Allan L. Lovaas. 1970.

Game Management in Montana. Edited by Thomas W. Mussehl and F.W. Howell. 1971. *Out of print.*

Life history and habitat requirements of sage grouse in Central Montana. Richard Wallestad. 1975.

Saga of the Sun - a history of the Sun River elk herd. Harold D. Picton and Irene E. Picton. 1975.

First Printing

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FOREWORD

Natural resources in Montana have always been changing. Their evolution was not affected by humans. For thousands of years Montana's face changed in accordance with natural forces.

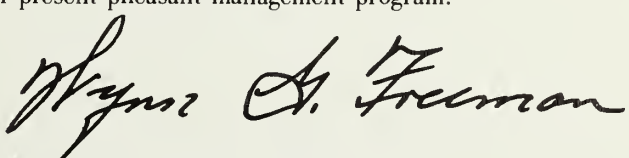
Inhabitation by humans did not appreciably alter this land of "Oro y Plata" until the 1800's. Then, the seemingly limitless resources were discovered and an "Era of Exploitation" followed. Gold, silver, copper and other minerals were extracted from the earth, timber was cut, cattle and sheep appeared on the rangelands and homesteaders began replacing prairie vegetation with cultivated grains. Native wildlife diminished with the accelerating changing of Montana's environments and competition for space.

The first pangs of conscience for wildlife were felt about 1900, when the conservation movement started. The earliest phase embraced protection of the remaining wildlife. Montanans had very limited knowledge of the natural rules governing their environment, so they attempted to save the disappearing wildlife with restrictive hunting regulations and establishment of wildlife preserves. Some tried to replace native wildlife with exotic species. Thus without discovering real reasons for the demise of Montana wildlife and with little knowledge of the requirements of exotic species, the ring-necked pheasant was imported into Montana.

Since its introduction into the state about 1900, the ring-necked pheasant has attracted Montana hunters, land owners and bird lovers. The pheasant's compatibility with early land uses and farming practices contributed to its charisma and the greatest densities often occurred in relatively heavily populated farming areas. In addition, the spectacular coloration of male pheasants further endeared them to farming communities. Sporting and table-fare qualities settled any remaining arguments about maintaining pheasants in Montana.

Beginning in the 1940's, a second conservation phase promoted ecological principles and concepts in wildlife management. Briefly they stated that each wildlife species requires a certain kind of environment. Defining environmental requirements and relating changes in wildlife numbers to environmental changes necessitated employment of specialized scientists, namely game biologists. While these scientists are still unraveling many of Nature's wildlife mysteries, a great deal has already been learned about the ring-necked pheasant.

The purpose of this bulletin is to present ring-necked pheasants as they are, how they live and how they die. It explores the various biological and ecological phenomena which contribute to pheasant population fluctuations in Montana. Blending of this knowledge with that from population and habitat studies in Montana has resulted in our present pheasant management program.



Wynn G. Freeman, Administrator
Game Management Division

DEDICATION

This bulletin is dedicated:

to those game biologists, in field through administrative positions, who relied on ecological principles and scientifically collected data to recommend pheasant management procedures for Montana,

and to those sportsmen and landowners whose faith in scientific pheasant management, supported those recommendations.

ACKNOWLEDGMENTS

Preparation of this bulletin was feasible only through the cooperative efforts of many people. The interest and encouragement of Wesley R. Woodgerd and Don L. Brown are acknowledged. Wynn G. Freeman and Joseph L. Egan, offered criticisms and encouragement throughout manuscript preparation. Merle J. Rognrud provided criticisms and much of Montana's historical information. Eugene O. Allen assisted in editing the manuscript and administered logistics of final publishing. Thanks are due to James L. Mitchell, Regional Game Manager, for providing the senior author time to inspect pheasant ranges throughout Montana and to begin manuscript preparation.

Most grateful acknowledgment is extended to Thomas W. Mussehl, for his extensive editing and encouragement during the entire bulletin preparation period.

Information necessary for the construction of the story of pheasants in Montana would not have been available without the field investigations conducted by game biologists and some of the game wardens. The countless hours expended by these people in the field observing and recording vital statistics on pheasants support the thesis that Montana pheasant management is based on facts.

Game biologists also assisted in preparing discussions concerning pheasant populations and habitats for their respective regions in the state.

The U.S. Agricultural Stabilization and Conservation Service, Montana State office, provided information on land management practices supported with federal funding. The Montana Department of Agriculture and U.S. Department of Agriculture Statistical Reporting Service, Helena, furnished crop and livestock information for Montana. County Agricultural Extension agents throughout Montana provided the alfalfa harvesting dates.

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THE AUTHORS

John P. Weigand received a bachelor of science degree in biology from Wisconsin State University (Stevens Point) in 1958 and a master of science degree in wildlife management from Michigan State University (East Lansing) in 1960. During 1959-61 he was employed by the Montana Department of Fish and Game as a game management biologist to conduct big and small game investigations in southeastern Montana. After a year's leave to obtain additional graduate education he was employed by the Nebraska Game, Fish and Parks Department as a district game supervisor, 1962-66. In this capacity he planned and supervised statewide pheasant surveys as well as conducted investigations on all game species in southwestern Nebraska. Returning to Montana in 1966, Mr. Weigand conducted investigations of big and small game as a game management biologist in Great Falls. Since December, 1968 he has been researching Hungarian partridge ecology in Teton County. He also supervises Montana's statewide upland game bird wing envelope survey. Mr. Weigand is a regular member of the American Ornithologists' Union and a life member of The Wildlife Society. Six of the 14 popular and technical articles he has authored and co-authored have dealt with the ring-necked pheasant.

Reuel G. Janson received his bachelor and master of science degrees in wildlife management from Utah State University (Logan) in 1940 and 1946, respectively. As a game biologist with the South Dakota Game, Fish and Parks Department, 1946-55, he conducted investigations on pheasants, prairie grouse and wild turkeys. He has been employed by the Montana Department of Fish and Game as district game manager in Great Falls, 1955-61, and as regional game manager in Missoula, 1961 to the present time. Duties of these managerial positions required his supervision of investigations of all big and small game species within a sizable portion of Montana. Mr. Janson is an active member of The Wildlife Society and The Wilderness Society and is currently a member of the inter-agency elk-logging research committee in Montana. He has authored and co-authored several articles concerning pheasant, grouse and big game management.

1

HISTORY OF PHEASANTS

Origin

Montana's ring-necked pheasants belong to a mixture of races descended from Asian ancestors. They are part of a "superspecies", *Phasianus colchicus*, which includes 30 or more subspecies native to a temperate belt of Asia stretching from the Black Sea east to Formosa and Japan. Most introductions into the United States were either English or Chinese pheasant, with a sprinkling of Mongolian and Japanese green pheasants.

English pheasants belong to the group known as black-necked pheasants which are native to the Caucasus. They are distinguished by their general purplish color, brownish wing coverts and lack of a white neck-ring. Early Greek voyagers, possibly including Jason's Argonauts, found these pheasants abundant in the valley of the Phasis River of Transcaucasia and introduced them into Greece. Their generic name *Phasianus* is derived from the Phasis River and their specific name *colchicus* from Colchis, the ancient province through which the river flowed. The Romans distributed birds from Greece through western Europe during the expansion of their empire. Pheasants were well established in France and England before the Tenth Century.

Chinese ring-necked pheasants are part of a group of subspecies in eastern Asia[1] and are distinguished by their light gray or bluish rump and wing coverts. Most of the subspecies, including the Chinese pheasant, have a conspicuous white neck-ring. The Chinese ringneck is native to eastern China. Pictures of pheasants painted by Chinese artists more than 3,000 years ago are the earliest known records of these birds. The Chinese ringneck was established on the island of St. Helena in 1513 and in England in the 18th century where it interbred with the English blacknecks. It became abundant in Europe and America during the 19th century and is the prevalent strain in the United States today.

The Mongolian pheasant apparently is misnamed since it is a native of the Lake Balkhash area of Central Asia, not Mongolia[1]. Distinguishing features are a general

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[1]Reference number, see Literature Cited.

maroon color with a greenish cast, white wing coverts and white neck-ring. It was introduced into Europe and America after 1900 and has interbred with acclimatized varieties.

Japanese green pheasants are considered a separate species, *Phasianus versicolor*[1] although they breed freely with other true pheasants. They are characterized by their general greenish body coloration. They are native only to Japan, but were naturalized in Europe by 1860, in Oregon in 1880, and later in Hawaii. They are wilder birds, and game breeders crossed them extensively with ringnecks and blacknecks to produce sportier game birds.

That pheasants eventually became successfully established in Montana was not a matter of mere chance. Original Asiatic pheasant haunts were quite similar, geographically and climatically, to available Montana habitats (Table 1). Montana is within the latitudinal and weather limits of Asian pheasant ranges while agriculture is the dominant land use in both regions.

History in the United States.

Early attempts to establish pheasants in the United States were largely unsuccessful. The first attempt was made in New York by the Governor, Col. John Montgomerie, in 1733. He released about 6 pairs of English pheasants on Governors Island. The birds flourished for a few years and spread to Long Island, but then disappeared. Between 1790 and 1800 three unsuccessful introductions of English pheasants were made in New Hampshire and New Jersey.

Pheasants became established in the eastern United States around 1890 as a result of successful releases in New Jersey (1887), New York (1892), Pennsylvania in the 1890's, and other northeastern and midwestern states soon after.[3] These early releases were made by estate owners interested in enhancing the value of their lands for recreation. The success of some of these ventures stimulated ordinary hunters and, thus, game departments, to participate in pheasant stocking programs. The first public hunting season in the east was in 1902 in Pennsylvania.[3] The season was two months long with no bag limits, and the kill was negligible. New York had its first public hunting season in 1908; hunters were limited to a season bag of 3 cocks and a kill of 4,169 cocks was reported. Pheasant hunting in the east and mid-west did not get into full swing until the 1920's and 30's after many years of stocking, restricted seasons, and natural increase.

The first really successful pheasant transplant in the United States occurred in Oregon in 1881. The United States Consul General at Shanghai, Judge Owen N. Denny, obtained Chinese ring-necked pheasants and shipped them to his brother's farm in the Willamette Valley. By 1892, the original transplant of 28 birds had increased so dramatically that a 75-day hunting season was opened and hunters bagged 50,000 pheasants the first day. Nearly half a million pheasants were taken during the full season.

Introduction into Montana

Montana, prior to agriculture, was poorly suited for pheasants. The unbroken expanses of rangeland did not produce the concentrated food sources that pheasants require. Even after the advent of agriculture, the semi-arid climate severely limited crop production and pheasant habitat. Irrigation was introduced into the

Table 1. **Geographic, climatic and agricultural similarities[2] between Asiatic and Montana pheasant habitats.**

Region	North-Latitude	Type of Climate	Average January Temperatures	Average July Temperatures	Average Annual Precip. (inches)	Agricultural Crops	
						Primary	Secondary
China	25° to 40°	Semi-Arid to Warm or Cool Moist	0° to 50°F	60° to 90°F	up to 60	Rice	Wheat, Corn
Mongolia	40° to 50°	Semi-Arid	up to 30°F	50° to 80°F	up to 20	Livestock	Grain
U.S.S.R. (Southeast)	40° to 50°	Semi-Arid	Above 10°F	60° to 75°F	over 16	Corn	Barley, Sugar Beets
Montana	45° to 49°	Semi-Arid to Cool-Moist	0° to 40°F	50° to 80°F	12 to 24	Wheat	Barley, Corn, Sugar Beets

Early-1900 farmers near Charlo had small, diversified farms favorable for the establishments of pheasants. *(Photo Courtesy of Montana Historical Society)*

Bitterroot Valley in 1842 by Father DeSmet, the Jesuit Priest who founded St. Mary's Mission, the first settlement in Montana. Miners irrigated the bottom lands of Alder Gulch in the late 1860's after the flow of gold from their diggings dwindled. Settlers in the Gallatin and Beaverhead Valleys readily accepted irrigation and developed cooperative ditch systems. As in most of the West, these irrigated cropland areas provided the earliest pheasant range.

In spite of these developments, agricultural progress was slow. The first territorial agricultural records in 1870 showed that only one-tenth of one percent of Montana's area was farm land, and most of this was in the western part of the state. Domination of the plains region by hostile Indians was an important reason for slow agricultural development in eastern Montana. After 1870, the agricultural pace accelerated and by 1900 nearly 13 percent of Montana's land was farmed. As more acreage came under cultivation, the environments became less favorable for the native sharp-tailed grouse and more suitable for the exotic ringneck. Displacement of sharp-tails from the western Montana valleys by farming and grazing created an upland game bird void; hunters began looking for a bird to fill this niche. The pheasant was a promising candidate.

Pheasants were apparently introduced into Montana prior to 1895. According to the first biennial report of the Fish and Game Commission in 1902: "These birds have been imported and turned loose year after year but their propagation has been anything but successful."

Between 1909 and 1929 approximately 7,000 pheasants were released in Montana. During 1909-1920, releases were made chiefly in Lincoln, Flathead, Lake, Ravalli and Teton counties. Pheasants were released near Glasgow and Lewistown in 1920 and were reported to have done well. Subsequent releases were distributed throughout the state. Most of these birds were obtained from commercial breeders

in Washington, Utah and Oregon. Some pheasants were liberated directly into "the wild" while others were "farmed out" to poultry growers who attempted to propagate them with varying degrees of success. Several thousand eggs were purchased and distributed to various organizations, sportsmen and farmers to hatch, rear and release.

By 1926 pheasants were abundant in some areas of the state, and the Commission received a petition from Ravalli County residents requesting an open season. This was denied because the Commission had no authority to open a pheasant hunting season. During the next 2 years petitions and requests for seasons were received from sportsmen's organizations in Missoula, Cascade, Broadwater, Big Horn, and Fergus Counties. Complaints of crop damage by pheasants at Fromberg and Polson were received during this period. In 1927 the Legislature authorized the Commission to regulate the hunting of pheasants. In 1928 the Commission proclaimed a 2-day pheasant season effective November 24 and 25. According to subsequent accounts, a predicted slaughter failed to materialize and few birds were killed.

By 1940 pheasants had become the most popular game bird in Montana. Their population reached its peak between 1940 and 1943, and then crashed to the lowest ebb recorded in 1945. The decline resulted in a statewide closed season in 1946. Hunting was reopened for an 8-day, 2 cocks per day, season in 1947. Hunters were able to bag an estimated 198,000 pheasants during a 12-day season in 1948.

Since 1958, more pheasants have been harvested annually than any other upland game bird in Montana. During 1958-1973, hunters bagged an average 161,000 pheasants per year.

By the early 1960's there were indications that all was not well in portions of Montana's pheasant range. At the present time pheasants have reached the point of scarcity in some areas of early abundance. The reasons for pheasant population increases and declines, and the future outlook for pheasants in Montana will be explored in this bulletin.

SUMMARY

Ring-necked pheasants in Montana today originated from several regions in Asia. They arrived in Montana in the late 1800's and early 1900's via Oregon, Washington and Utah. The habitat required for successful pheasant establishment in Montana was unavailable until 1900; by the mid-1920's pheasant populations in some areas of the state were dense enough to cause crop damage. In 1927 the Legislature authorized the Montana Fish and Game Commission to proclaim hunting seasons on pheasants. By 1940, the pheasant had become Montana's most popular upland game bird. By the early 1960's, pheasant populations in many areas of the state were on the decline.

2

PHEASANT ECOLOGY

Although the science of ecology dates back to the early Greek philosophers, it did not become a recognized field of biology until about 1900.[4] In recent years the word "ecology" has been used, and abused, perhaps more than anytime in its history. Ecology should be viewed as the study of the relationships between organisms and their environment. An organism is dependent upon its environment for existence, i.e. the organism is part of, and a product of, its environment. In this bulletin then, pheasant ecology pertains to relationships of the pheasant with the various factors in its environment. That these relationships do in fact exist is fundamental to accepting information presented in the remainder of this bulletin.

While we make no claim to understanding total pheasant ecology, there is sufficient information available to formulate a working knowledge of this complex subject. In this chapter we will examine the biology of pheasants first, then the reactions of pheasants to individual factors in their environment.

ANNUAL LIFE CYCLE

Breeding

The sex organs of pheasants begin enlarging about February 1 in Montana.[5] Cocks are capable of breeding by late February and hens could lay fertile eggs by late March. Winter weather, which often prevails through March in much of Montana, delays serious mating attempts until April.

As winter weather subsides and days become longer and warmer, pheasants move from winter cover to spring territories. Eighty-five percent of the pheasants move less than a mile between these areas and about half of the population moves less than 1/2 mile.[6] While some winter-spring movements up to 7 miles have been reported,[7] they are unusual.

Each pheasant cock selects a breeding territory which he defends from trespass by other cocks. Older, experienced cocks choose the choice sites and young, novice cocks compete for left-over areas. Fights between cocks involve considerable commotion. Each cock attempts to gain superiority by jabbing his opponent with his sharp beak, beating him with flailing wings and gouging with the spurs on his lower legs. Occasional lulls in combat occur while the cocks negotiate, beak to

Pheasant hen approaching cock on his spring territory. *—(Photo by J.P. Weigand)*

beak, while resting on the ground. Whether through physical intimidation or negotiation, one cock (usually the intruder) leaves the territory.

To attract hens, cocks utter loud two-syllable crowing calls at 2 to 3 minute intervals. Crowing begins in late March, reaches a peak in May and then gradually subsides. Sporadic crowing may be heard through July.

The appearance of a hen or hens on the male territory results in elaborate courtship display by the cock. The red eye patch (enlarged during the breeding season), body colors of chestnut, yellow, blue and brown, and the long tail of the cock are displayed to the hen. The cock, with ear tufts erect, struts, bows and spreads his wings; in short, he displays these features most advantageously to the seemingly unconcerned hen.

Each cock will mate with any receptive female that enters his territory. While individual males in captivity have been known to mate with more than 50 hens during a single season with 87 percent egg fertility,[8] mating opportunities in the wild are fewer. A single mating is sufficient for production of fertile eggs for 11 to 42 days; the average is 22 days.[9]

Pheasant cocks and their harems of hens become noticeable by mid-April. During a study in the Yellowstone and Big Horn Valleys during 1943-44,[5] approximately 80 per cent of all pheasants observed were members of harems during the last half of May. After July 1, the occurrence of harems rapidly decreased. Cocks and hens are sexually active, however, until about August 1.

Nesting

Before nesting, hens frequently lay eggs at random, or deposit them in "dump nests." Several hens may lay eggs in a single dump nest and then abandon them. As many as 50 eggs have been found in dump nests.[8] Fertility rates for randomly dropped eggs and dump nest eggs are about 62 and 93 percent, respectively.[8] Egg fertility in incubated nests is about 96 percent. The incidence of random egg dropping and laying in dump nests appears to increase as the pheasant population increases.[10]

The earliest recorded pheasant nest in Montana was found on April 15[5]. Nesting activity peaks during the first half of May, although this will vary somewhat with location. The latest nesting activity was recorded on September 13.

The nest begins as a shallow depression scratched in the ground which the hen lines with grass and leaves. She visits the nest each day to deposit 1 egg, until the 9 to 12-egg clutch is complete. The 23-day incubation begins after the entire clutch is laid. During incubation the hen adds her own breast feathers and plant material to the nest lining.

Nests are found in a variety of cover types: roadsides; irrigation ditches and ditchbanks; fencerows; brushy areas with good undercover; unused weedy tracts of land; alfalfa and grass hayfields; grain stubbles and weedy fallow fields.[11 12 13 14] Nests in *undisturbed, residual* cover have the best chance of hatching successfully. Choice nesting sites are fairly close to field borders; about 70 percent of 281 pheasant nests in a Colorado study were within 15 feet of field edges.[15] When high quality cover is unavailable, hens will nest in almost any cover present. Nests in marginal cover have little chance of hatching and in many cases, the life of the hen nesting under these conditions is in jeopardy.

Dump nests containing large numbers of eggs are seldom incubated.

—(Photo by R.J. Fischer)

A majority of the original pheasant nests each year are destroyed by predators, farming operations, grazing livestock and weather. Fifty-nine percent of the nests in an Iowa study[16] and 87 percent of nests in a North Dakota study[13] were thus destroyed or deserted by disturbed hens. If the nest has not been incubated long when destroyed, the hen will renest and lay a new clutch of eggs. She will continue nesting attempts until she successfully hatches a clutch, until she loses a clutch late in incubation or until she can no longer produce eggs that season. Once a clutch is successfully hatched, the hen will not lay any more eggs that year.

The number of eggs laid per clutch decreases by one or more eggs with each successive attempted renest. An average first clutch of 10 eggs may be reduced by half in the third or fourth renests. While renesting tends to reduce the chances of a "bust" production year, broods from renests do not contribute as many chicks to the fall crop as chicks from initial, successful nests.

Sometimes pheasants lay eggs in nests of other birds, such as Hungarian partridge,[17] ruffed grouse,[18 19] and blue-winged teal.[20] Few of these pheasant eggs hatch; chicks which do emerge probably do not survive.

Stresses imposed by high pheasant densities also play a role in determining annual production.[11] Hens apparently tolerate only so much crowding by other hens while incubating their eggs. When a certain point of crowding is exceeded, hens will abandon their nests. In years when there are high numbers of hens per unit of nesting area, the number of nesting attempts per hen and the number of nests abandoned increases. In years of low hen density there are fewer nesting attempts per hen, fewer nests are abandoned and more nests are successful. Reasons for this behavior were explored through field experiments in Nebraska.[21] Incubating hens within hearing, but out of sight, of pheasant chicks showed no tendency toward nest abandonment. When incubating hens were within sight and hearing of chicks, almost half abandoned their nests. When chicks were placed in an enclosure which included incubating hens, there was total abandonment of nests.

Brood Season

Each pheasant hen hatches only one brood during each summer, but because of renesting, broods of many different ages can be seen at any given time during the summer.[5 22] Young chicks may be observed from May to September, but the hatching peak is usually in mid-June. Hatching dates for Montana regions are presented in Chapter 4.

During hatching the chick uses its egg tooth, a temporary projection from the top of the beak, to chisel a cap off the large end of the egg and thus emerge into the world. When the young are dry, the hen leads the brood from the nest and they do not return to it. Brood movements within the first 3 weeks of hatching are restriced to 5 or 10 acres around the nest site.[23] Brood movements may cover areas up to 50 acres during the entire summer.

Life is hazardous for young pheasants and mortality is high. Mortality between hatching and 2 weeks of age may be as high as 25 percent and increase to almost 50 percent by 9 weeks of age.[16] Broods averaging about 10 chicks at hatching time are reduced down to 5 or 6 chicks by September. During years of extensive renesting, broods may average less than 4 chicks by September. It has been suggested that

A pheasant hen incubating eggs in heavy, undisturbed cover. *—(Photo by R.J. Fischer)*

After 23 days of incubation the chicks emerge from eggs. *—(Photo by R.J. Fischer)*

broods tend to become independent at an earlier age with higher pheasant populations, perhaps due to less attentiveness by their mothers.[12] The main causes of chick losses are chilling rain or hail storms, predation, road traffic and farming operations.

Summer is a period of stress for the hens. Many of them have laid more than one clutch of eggs. Once a clutch is hatched, the hen must brood the young and teach them to fend for themselves. When the chicks are 3 or 4 weeks old, hens begin molting, that is, shedding old feathers and growing new ones. These activities use up much energy and hens in poor physical condition may die during the summer.[24 25] Summer losses, though less obvious, may be greater than winter losses in some years.

Pheasant cocks, compared to hens, spend the summer in relative leisure. Cocks have no regular family duties after mating, though they are often seen accompanying hens and broods during the summer. While all pheasants continuously face environmental hazards, summer activities of the cock are generally limited to molting feathers and replenishing body reserves.

Fall

Fall is a period of pre-winter conditioning. Young birds have reached adult size and broods have broken up. Food, consisting of succulent vegetation, weed seeds, berries, insects and grain, is plentiful. Pheasants feed avidly, building up fat deposits to provide energy during the winter.

Vegetative cover of summer habitat is reduced by the harvest of agricultural crops and grazing by livestock by fall. Even so, pheasants continue to frequent these areas, taking advantage of whatever cover is available.

Fall also brings the hunting season, popularly overrated as a major cause of pheasant mortality. A discussion of the effects of hunting on pheasant populations is presented in Chapter 3.

During October-December pheasants move from fall to wintering areas. Movements average about 2/3-mile with few moving more than 1 1/4 miles to winter ranges.[26]

Winter

Winter is a particularly critical time for pheasants on the northern plains and prairies. High-energy foods are required for body processes accelerated by prolonged cold weather. Heavy protective cover is needed to shield pheasants from storms and predators. Food and cover are sometimes buried under deep snow for several weeks. Starvation in pheasants is uncommon, but it may occur under unusually severe winter conditions. Drifting snow often buries small cover areas, thus exposing birds to predators.

Heaviest winter losses occur during severe blizzards. Birds caught in the open often crouch and face the storm. The blowing snow then fills their nostrils and mouth, and suffocates them. Birds which turn their tails to the storm do not fare any better. The wind drives snow under their feathers, and they die from exposure. Sometimes whole flocks in small, inadequate patches of cover are buried under deep drifts of hard, crusted snow. Many of these birds are entombed alive, and starve

Pheasants without sufficient cover frequently suffocate when their nares (nostrils) and beaks become filled with ice. *—(Photo by R.J. Fischer)*

under the snow. Losses of more than 90 percent of local populations have occurred during severe blizzards in Montana and other Great Plains States.

Following "average" winters pheasant populations usually rebound with a single good production season. Population recovery following catastrophic winters may require several good production years before pheasants are as numerous as before. If available, adequate winter food and cover can minimize winter losses and sustain vigorous breeding populations to begin the life cycle anew.

Movements during December-February depend largely on the severity of the weather and the quality of cover. Pheasants choose to remain in protective cover close to food sources and movements may be negligible during severe weather.[27] Mild winters may result in pheasants foraging further from wooded areas.

POPULATION DYNAMICS

Many animal species are potentially capable of overrunning the earth. One pair of pheasants could increase to 20,000,000 in 10 years even if each hen lived only 18 months (long enough to produce 1 brood). In 20 years, at this rate of increase, the living descendants of the original pair would number nearly 200 trillion. Obviously this potential is never attained.

A System of Checks and Balances

Nature provides a system of checks and balances which does not permit any species to increase indefinitely. The breeding potential (a combination of numbers

of sexually mature animals, numbers of young per clutch or litter, numbers of clutches or litters per year) acts to increase animal numbers. On the other side, a variety of environmental influences (habitat deficiencies, population stresses and mortality through accidents, diseases, predators and weather) act to limit or decrease animal numbers (Fig. 1).

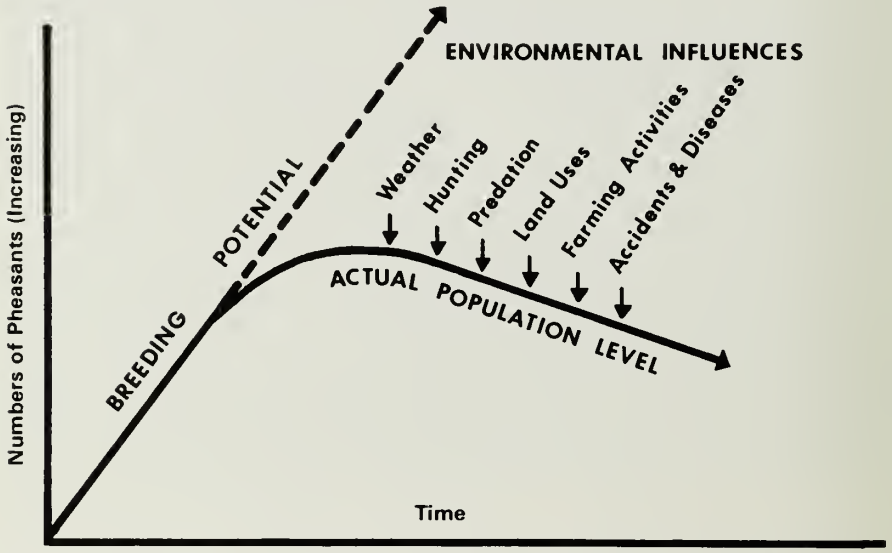


Figure 1. **Pheasant populations equal breeding potential minus environmental influences.**

An animal species introduced into suitable environmental conditions, orients itself to the new situation and begins to increase in numbers. Once a population base is established, numbers increase at a compounded rate. Mortality occurs throughout initial expansion but does not, under near-ideal conditions, eliminate the population. All earthly environments have finite limits; because Nature is dynamic, these limits are constantly changing. When animal numbers exceed these limits, a population decrease (frequently quite severe) occurs. Once within or below environmental limits, the population again increases. Again it exceeds environmental limits, then decreases again, and so on. This see-saw process continues throughout the population's existence and true equilibrium is never quite attained.

In Montana, pheasant populations reached high densities during periods when environmental conditions were favorable. The late 1930's and early 1940's were such a period. Climatic conditions were generally mild; vast areas of farm land had been abandoned or retired from cultivation and had grown up to tall weeds which furnished both food and cover; enough grain was grown to supply a concentrated food source for winter; farming practices permitted bountiful crops of weeds and insects; and shelterbelts of trees and shrubs were planted. Pheasant populations virtually exploded.

Then under the influence of war-time demand for more food production, and with greater rainfall, higher crop prices and a variety of government programs for farmers, the abandoned farm land was put back into crop production. Under the

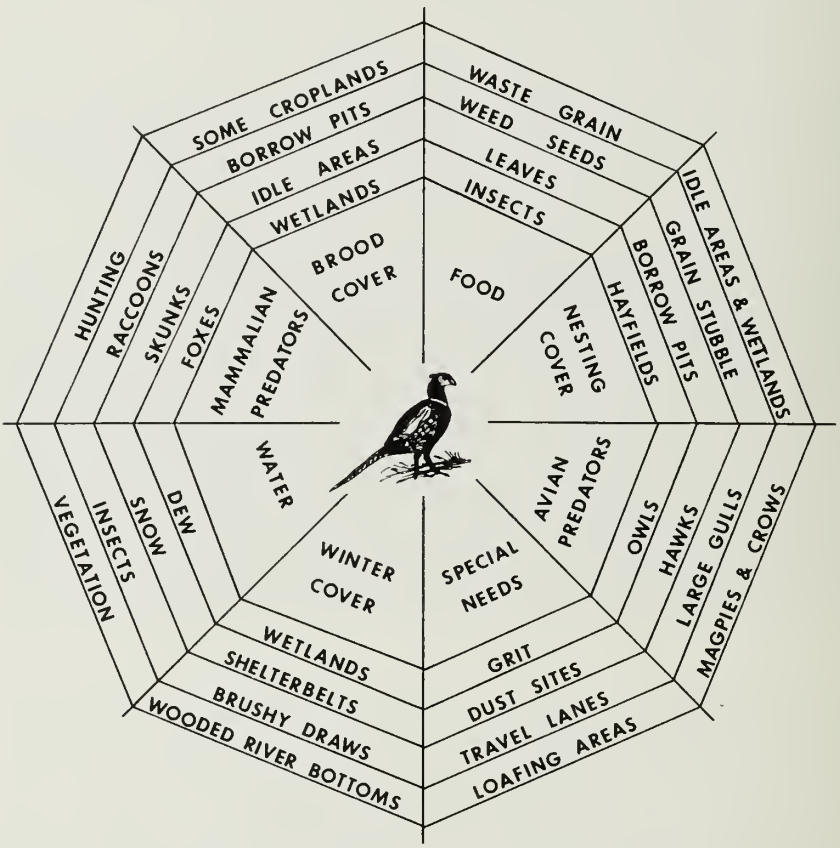
booming economy, farm and pasture lands were more intensively used, and countless pheasants lost their havens.

By 1943 pheasant numbers exceeded environmental limits (which were being rapidly lowered) of their range, and the "crash" which followed during 1944-46 was as impressive as the earlier boom.

Since this major fluctuation in the 1940's, pheasant numbers in Montana and elsewhere have undergone highs and lows. None of the "highs" have equalled that of the early Forties and, until the past few years, none of the "lows" have been as low as that of the mid-Forties.

Ungrazed (upper) and grazed (lower) potholes—which do you think is most valuable to pheasants? *—(Photos by: J.P. Weigand)*

Peak pheasant populations of the early-1940's *should not* be interpreted as "normal" long-term levels. Exceptionally good environmental conditions led to these outstanding populations. And, exceptionally poor environmental conditions have resulted in noticeably low pheasant populations. Simply stated, pheasants are merely trying to achieve their biological potential and, at the same time, are responding to existing environmental influences. The resulting population level represents "normal" for that particular situation at that particular time.



THE PHEASANT'S WEB OF LIFE

Seasonal Population Changes

Pheasant populations experience seasonal changes in numbers as well as long term fluctuations. Pheasant numbers are usually at their lowest point during the breeding season; it is from this base that the population replenishes itself. Pheasant numbers reach their highest point during the early summer brood season.

The potential rate of increase of a pheasant population is about 600 percent each year. Theoretically the successful mating of a cock and a hen could result in the hatching of 10 chicks (the original population of 2 birds has now increased to 12

birds, an increase of 600 percent). Since the carrying capacity for that particular piece of land supported only 1 cock and 1 hen in the spring, it will very likely support about the same population the following spring. Natural mortality, including egg loss, has to be about 83 percent (10 birds÷ 12 birds = 83 percent loss) to bring this population back to the area's carrying capacity. Seasonal population fluctuations are presented in Figure 2.

Both of these percentages vary under actual field conditions. They vary from area to area and from one year to the next. Biological variables which also affect these percentages include the fact that normally one cock mates with several hens each spring. Cocks and hens experience annual losses in proportion to their abundance in the population.[28] Clutches of eggs differ in size with individual hens and with renesting. And young birds annually suffer greater losses than old birds. The maximum breeding potential is seldom achieved and the average mortality ranges between 60 and 70 percent.

The average life expectancy for ring-necks is measured in months, not years. A young pheasant surviving to the following spring becomes an adult; only about 3 out of 10 make it. A 2-year old bird is comparatively old and birds that live to see three or more birthdays are oldtimers. Research has indicated that these old birds usually make up five percent or less of the total population.[5] Complete population turnover (i.e. length of time for all birds hatched during any 1 year to die) is experienced within 5 years.

The quality and quantity of habitat in a given land area is the main factor which determines if a pheasant population will maintain itself, increase or eventually die out.

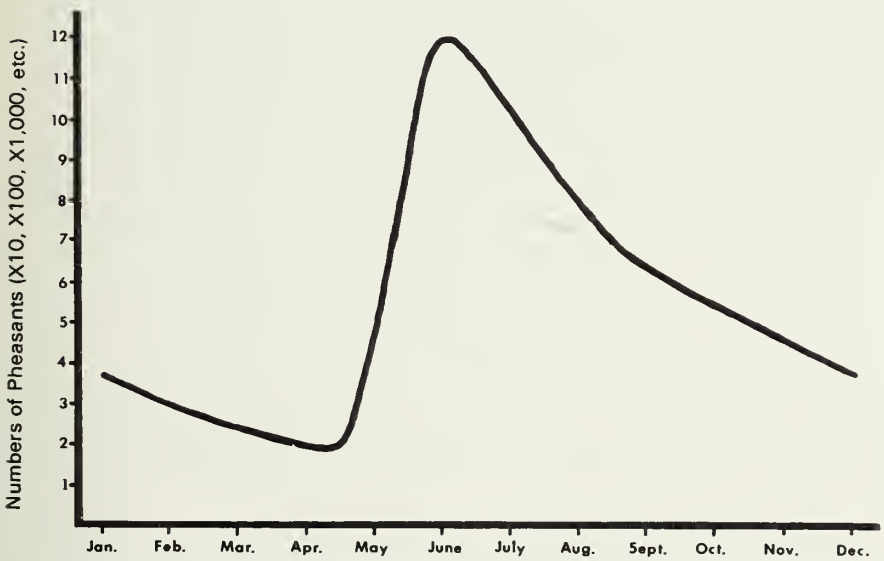


Figure 2. **The annual pheasant population cycle.**

HABITAT REQUIREMENTS

Cover

Different cover types perform various functions in the lives of pheasants. Thickets of shrubs and trees provide shelter from weather; they shade pheasants on hot summer days and from wind-driven snow during the winter. Woody plants, especially thorny shurbs, protect ringnecks from ground and winged-predators all year long. Wetland areas and weedy patches are used for roosting and loafing. Cattail and bulrush sloughs are also favorite hiding places during the hunting season. Fencerows, roadside ditches and field edges that are well vegetated provide travel lanes for birds to move inconspicuously between areas.

Nesting and brood cover are more specialized in their functions. An abundance of nesting cover in early spring is especially important for successful nesting since early clutches and broods are larger than later ones. Nesting cover must be dense enough to prevent detection of the nest and incubating hen by predators. Brood cover must conceal the hen and her brood, as well as provide food while the chicks are too small to travel very far.

Undisturbed, residual vegetation fulfills most of these nest and brood cover needs. Roadsides, railroad rights-of-way, fencerows, shelterbelts, marsh edges, stream and ditch banks and abandoned farmsteads which have grown up in weeds and grass, all provide good nesting cover. Grass or alfalfa hay fields often furnish nesting cover until mowing time, but then become death traps for hens, eggs and chicks. The Soilbank Program, 1956-1969, provided thousands of acres for nesting birds in Montana (see Page 62). Expiration of these land retirement contracts returned prime pheasant nesting and brood areas to agricultural uses, withdrawing most of them from pheasant production.

Open or sparsely vegetated areas are visited by broods when denser vegetation is wet from dew or rain.[30] Dusting and grit-picking sites also tend to be in more exposed areas. Such areas are usually adjacent to denser escape cover.

Diversity of Cover Types

In 1933 Aldo Leopold, considered by many as "The Father of Game Management", stated: "Game is a phenomenon of edges. It occurs where the types of food and cover which it needs come together".[22] Credibility was added to Leopold's thesis in a recent Montana pheasant ecology study[30] which concluded: ". . . the more diverse areas supported or attracted the most pheasants, as long as these areas provided the necessary combination of vegetation (food, escape cover, loafing areas, etc.)."

Pheasants thrive in farming areas, but there must be a balance between amounts of cultivated and non-cultivated land. Pheasants may occur in intensively farmed (or grazed) areas, and also where there is little farming, but they will not be as abundant as in areas having adequate amounts and proper interspersion of food and cover.

For optimum pheasant habitat the necessary vegetation types must be close to one another. Abundant food is useless if protective cover is not available nearby, and good cover will support few birds unless it is near abundant food. Conse-

Until the mid-1950's, strips of good vegetative cover between grain fields could still be found. *—(Photo by R.J. Fischer)*

Advanced farming technology and machinery have farmed-out these pheasant producing areas. *—(Photo by R.J. Fischer)*

quently, Montana's dry-land (non-irrigated) grain belts provide vast quantities of food but lack cover for nesting and protection from predators and storms. Extensive grain belts produce few pheasants except where the grain fields are frequently interrupted by brushy draws. Conversely, many fields bordering woody cover along streams, previously cultivated for grain are now growing alfalfa. Protective woody cover may still exist (though much of it is grazed by livestock), but major food sources are gone and pheasant numbers have declined accordingly.

Food and Water

Kublai Khan, the 13th Century Mongol emperor, took advantage of pheasants' dependence on agriculture to insure an abundance of game birds for his own

hunting. Marco Polo reported[1] that "the Great Khan causes millet, and other grains suitable to such birds, to be sown — and gives strict command that no person shall dare to reap the seed; in order that the birds may not be in want of nourishment — and in consequence of these attentions, he always finds abundant sport when he visits this country."

In Montana, pheasants eat a variety of food items but cereal grains form the bulk of their diet. A Montana Fish and Game Department study[31] in the Bighorn and Yellowstone Valleys in the 1940's found that farm crops furnished 77 percent of the pheasants' diet. Wheat, barley, corn and oats were the most important items. These were obviously preferred foods since the combined acreage of all four crops was only one-fourth of the total project acreage. Beans, peas and sorghum were also eaten but in much smaller quantities.

The seeds of weeds and grass, most of which are considered undesirable (by farmers) in cultivated crops, comprised about 7 percent of the total food consumption.[31] Most important of these were wild oats, Russian thistle, sunflower, bristle grass, dandelion and sweet clover.

Leaves and other plant parts made up less than 2 percent of the total food.[31] The items eaten most were leaves of alfalfa, prickly lettuce and sweet clover, and root fragments of prickly lettuce uprooted by plowing.

Wild fruits amounted to less than 3 percent of the total food volume.[31] Snowberry was the most important, with small amounts of chokecherry, buffalo berry, and wild rose also being eaten.

Corn-growing areas in young Montana provided pheasants with a veritable utopia of food and winter cover. *—(Photo Courtesy of Montana Historical Society)*

Animal food, mostly insects, made up 9 percent of all pheasant food.[31] Cutworms, grasshoppers, crickets and snails were most important. Insects are particularly important to young chicks as a rich source of the protein needed for growth. During the nesting season, snails have been found in the crops of pheasant hens;[31] snails are believed to provide calcium for egg shell formation.[32]

Pheasants also eat numerous small rocks, or grit, which are retained in the gizzard. Contractions of this muscular organ grind the grit against morsels of food to prepare them for digestion in the intestines. Since grit is slowly ground away during this process, and some of the ground particles are excreted regularly, pheasants require a daily source of grit. Grit-starved pheasants will lose weight rapidly and will eat large quantities when it is again available.[33] During snow-free months, grit is generally plentiful in Montana but when deep snow covers fields, pheasants visit streambeds and roadsides to obtain grit.

Grit is a primary source of calcium essential to hens during egg-laying and to chicks during their rapid, early growth (bone development period). Experimentally, pheasants preferred calcium-bearing grit to non-calcium grit.[33] Poor pheasant production in some areas has been attributed to a lack of calcium-grit. The absence of calcium-grit is also suspected as a reason for the failure of ringneck establishment in some regions of the United States.

Much of the grain that pheasants consume is waste and consequently of no value to farmers. Sample counts of grain along a road shoulder south of Hardin indicated that at that time there were 1.6 tons of waste wheat per mile of road.[31]

During periods of high population density, pheasants cause some crop damage. They may damage sprouting corn by pulling or digging up the young plants and eating the kernel. This is usually local damage confined to field borders near cover. It can be reduced or even avoided by scattering some ear or shelled corn around the edge of the field when the young plants start to emerge from the ground. Tomatoes, melons and other fruits and garden vegetables are occasionally damaged by pecking pheasants. Pheasants are sometimes blamed for damage done by other birds, mammals or insects.

Under the stress of unusual conditions, pheasants turn to foods not ordinarily used. During severe winters, when preferred food is scarce, pheasants will feed on buds from shrubs. Some pheasants, faced with starvation, have been known to feed on the flesh of road-killed pheasants and other animals.[34]

Pheasants obtain water from succulent foods such as insects, fruits and green vegetation. Rain and dew collected on vegetation is used during the summer while snow provides moisture in the winter. Water in other free forms, such as in ponds, creeks and irrgation ditches is usually not necessary, although pheasants use it when it is available. Wetland areas are used by pheasants mostly for the protective heavy cover, rather than for the water associated with these areas.

FACTORS LIMITING PHEASANTS

Thus far we have discussed those factors which work toward increasing pheasant numbers. Factors which tend to check or decrease pheasant numbers include:

decimating factors: those environmental factors which result directly in the death of pheasants (e.g. accidents, diseases and parasites, predation, hunting, starvation and weather);

influencing factors: those environmental factors which affect local, short-term and long-term pheasant abundance (e.g. land uses affecting food, water, cover and special requirements such as cultivation, drainage, fire, grazing and pesticides).

If the effect of one factor outweighs all the other factors in checking or reducing pheasant populations, it is called a *limiting factor.*[22] Usually the combined action of two or more factors tends to hold down pheasant numbers.

Decimating Factors

Decimating factors include those which pose a constant threat to the lives of individual pheasants. Pheasant deaths, for the most part, result from natural causes although some (e.g. hunting, some accidents) result from human activities. The effects of these factors are usually short-term since a pheasant's demise releases its food, cover and water requirements to the benefit of surviving pheasants.

Accidents, Diseases and Parasites

Accidents befall pheasants regularly. Improvements in roads through pheasant country and the development of faster cars and trucks has resulted in many pheasant deaths each year. Pheasant chicks are particularly susceptible to automobile mortality after rain when they frequent roadsides to escape dripping vegetation.[12] Pheasants occasionally die after flying into utility wires, fences and even buildings. Pheasant hens nesting in hay fields, especially in alfalfa, are frequently killed or crippled during harvesting operations.[35] Young, flightless pheasants may also be killed during hay harvesting.

While there are only limited reports of diseased wild pheasants; it cannot be assumed that wild pheasants are disease-free. In fact, pheasants very likely evolved and continue to evolve in the face of several diseases. Whether or not wild pheasants transmit diseases to domestic poultry may be debatable. It seems more plausible that pheasants contract diseases through contact with diseased poultry and by feeding in contaminated areas.

Pheasants can contract a number of diseases including avian lymphomatosis,[36] botulism,[37] fowlpox,[38] fowl typhoid,[39] infectious hepatitis,[40] Newcastle disease,[41] ornithosis,[42] pullorum[43] and turkey erysipelas.[44] Some diseases are epidemic in killing chicks or adults while others result in only a few deaths or result in abnormal behavior due to illness. Many of these diseases are common to domestic poultry and most reported pheasant diseases deal with game farm-hatched or reared birds. The common denominator in these cases is the raising of birds under artificial, crowded conditions.

Pheasants are often hosts for chiggers[12] and several kinds of fowl lice.[6] Massive infestations of chiggers have been reported on pheasant chicks and while no deaths could be attributed to chiggers, the possibility seemed realistic.[12] Tapeworms,[6]

Accidents, such as collision with fence wires and utility lines, are included in the pheasant's annual mortality. *—(Photo by R.J. Fischer)*

roundworms and gapeworms[45] have also been found in pheasants. Pheasant chicks probably pick up more parasites because of their heavy feeding on insects which may be parasite carriers. Parasite loads in pheasants tend to be heavier in the summer than in other seasons and birds in dense populations have more parasites than those in sparse populations.

Diseases and parasites are a normal component of a pheasant population. Those which result in death of pheasants, either directly or indirectly (i.e. incapacitating pheasants which fall prey to predators), remove part of the population surplus. Once the population is thinned down to a point where disease transmission links are broken, the population rebuilds. Diseases and parasites, having been long associated with pheasants, may exert moderate, neutral or even beneficial effects as they selectively remove inferior individuals from the population (adapted from[4]). New maladies from which pheasants have no natural immunities, however, can be quite detrimental.

Predation

Paul Errington, a noted American ecologist who studied predator-prey relationships for over 30 years, noted:

"The study of predation is no field for snap judgments. Cause-and-effect relationships have, on occasion, their own ways of turning out to be quite different from what they may seem to be at first."[46]

Predation is a natural phenomenon which has evolved through millenia of close association of predators and prey. Predation is mutually beneficial to both predator and prey populations, albeit not necessarily to the individuals which fall prey. Prey species provide a food supply for predators. Predators in turn can, but

not always, "cull out" the diseased, non-alert, and otherwise handicapped individuals in prey populations. Thus predation aids in maintaining a healthy prey population within the limits of their environment.

Many predators are opportunistic, that is they will eat what is most available or vulnerable,[28 29 47 48] Many are omniverous (they'll eat almost any palatable plant or animal) and many are scavengers. Some predators specialize in preying on a single or a few prey species. No predators are known to specialize in preying on pheasants in Montana.

Cocks and hens are preyed upon in relation to their composition of the pheasant population.[28] Predation may reduce pheasant numbers to the security threshold of the habitat, but no further.[46] The security threshold, by definition, indicates the pheasant population is secure at that level and further predation attempts are fruitless. Security thresholds are determined by the quantity and quality of habitats. Habitats with high security levels support greater numbers of pheasants and low security levels support fewer pheasants. Pheasants living in a habitat with a security threshold of "zero" are living on borrowed time.

Because of this dependence on habitat availability, security levels may vary from season to season and from year to year. Summer security thresholds, because of large amounts of cover, tend to be relatively high and the lowest threshold normally occurs during the winter and early spring when protective cover is least available.

Predation, and other decimating factors, may not reduce a pheasant population to its security threshold every year. If some annual surplus is carried over to the next year, one or more mechanisms may take over:

(a) the pheasant population may regulate its overall production downward;
(b) surplus pheasants may disperse to adjacent habitats having lower security thresholds, and are taken there by predators;
(c) surplus pheasants may attract additional predators;
(d) other mechanisms (perhaps undiscovered) become active.

It may not be clear which mechanism(s) is (are) active in a given situation but the result in each case has been little net gain in succeeding pheasant populations. Pheasants cannot be stockpiled for prolonged periods of time!

The red fox, common throughout much of the pheasant's range, is often blamed for reducing pheasant numbers. Disregarding occasional preferences for plump poultry and sweet corn, fox feeding habits are beneficial to farmers. Foxes eat mostly rodents; pheasants comprise only a small percentage of their diet,[48 49 50 51 52 151] Systematic visits to roadsides for vehicle-killed pheasants and other animals are characteristics of individual foxes.[46] Foxes also eat a variety of vegetation; grasses and corn,[50] fruits and berries are taken in season.[50 53] Fox droppings (or scats) collected during July-September in Teton County, Montana contained noticeable quantities of grasshoppers.[54]

Remains of prey found at fox dens can be quite misleading in determining fox food habits. In Iowa, Errington noted:[151]

> "The principal criticism to be made against the recording of prey or food items from dens is that the larger carcasses, being more conspicuous and less likely to be eaten entire, are much more likely to be listed out of proportion to the frequency with which they may be brought in."

Foxes frequently get blamed for declining pheasant numbers; while some birds are killed by foxes, many are found as carrion and carried to den sites. *—(Photo by R.J. Fischer)*

In 1933 and 1934 he found pheasants comprised 27 percent of 3,858 food items identified at 313 red fox dens. Pheasant remains were found in only 8 percent of 2,110 fox scats collected during the same period!

During the early 1940's pheasants and foxes were coincidentally abundant in mid-west ranges. When pheasant populations crashed in 1944-45, hunters angrily accused foxes as being responsible. Pheasants on Pelee Island in Lake Erie, nine miles from the nearest mainland, experienced the same "boom and bust" situation.[12] There were no foxes on the island; in fact, there were few predators of any kind!

Other mammalian predators which eat pheasants or their eggs include skunks, raccoons, cats, dogs, weasels, ground squirrels, mink and voles,[55] [56] Skunks and raccoons relish eggs of any birds, but individual diets would be meager if they depended on pheasant eggs.

General avian predators (or raptors) in Montana include 2 species of eagles, 11 kinds of hawks and falcons, 8 species of owls, crows, magpies and some gulls. A study of golden eagles in Montana[52] showed that 97 percent of their diet was mammals, mainly jackrabbits, and that less than 1 percent consisted of pheasants. On a Michigan study area, raptors killed 16 percent of the annual pheasant populations.[28] A high loss of pheasant chicks to one hawk species was attributed to removal of brood cover through haying and wheat harvests. Pheasants constituted up to 20 percent of great horned owl diets; this mortality occurred while the owls were brooding their young and pheasants were moving about sparsely vegetated spring territories. Pheasants comprised only 0.1 percent of the fall-winter and less than 6 percent of all spring and summer raptor diets!

Pheasants are not helpless against predator attacks however; pheasant cocks have been observed routing marsh hawks from freshly killed prey[58] as well as jumping into the air to spur attacking marsh hawks.[54] Pheasants have also been observed displaying aggressive behavior toward the fox with subsequent retreat by the fox.[57]

Magpies, once bountied in parts of Montana because of their alleged limitation on pheasant production, hunt food by sight. Pheasant nests in sparse vegetative cover are more vulnerable to magpie predation than nests in heavy cover.[55] Reduction of magpie populations by 50 percent in Montana resulted in no measurable influence in increasing pheasant production.

Gull food habits were studied in the Fairfield area (Teton County) during the summers of 1958 and 1959.[60] Bird remains occurred in only four percent of the ring-billed and California gull stomachs examined. Insects and vegetation were the chief food classes consumed. While these gulls reportedly prey on pheasant chicks, gull predation appears insufficient to limit pheasant populations in this area.

Man is also a pheasant predator. He removes part of the annual pheasant surplus through hunting each fall. As with all predators, he may harvest pheasants down to their security threshold and no lower. The degree of hunter harvest determines, to a large extent, how many pheasants remain for predators the following winter. The greater the hunter harvest, the fewer surplus pheasants for predators. Curtailing or closing the pheasant hunting season merely leaves a larger surplus for predator repasts.

Accumulation of scientific evidence from many predator-pheasant studies indicates that unusually good success of predators reflects poor habitat and ensuing pheasant vulnerability rather than extraordinary skill of predators.

Weather

Variations in individual, or combinations of, weather factors play a decisive role in determining pheasant distribution and abundance. Other things being favorable, pheasants can sometimes tolerate extreme weather conditions.[61] For example, pheasants live and raise young in 120° F summer heat in California's Imperial Valley with an annual rainfall of only 3 inches. However, these extremes are tempered by man-made humidity resulting from intensive irrigation. Pheasants subsist in 116 inches of annual rainfall on Washington's Olympic peninsula, and 200 inches in Hawaii. They endure 30-40° F below zero winter cold on the northern plains and prairies. Ringnecks were transplanted into the Matanuska Valley of Alaska in 1939 and hung on for nearly 10 years before they died out.

Day length and temperature influence pheasant nesting activities. Increasing amounts of daylight in the spring stimulate hormone secretions in the hen. These hormones regulate the time egg-laying begins. Since the length of any given day is the same from year to year, egg-laying begins at approximately the same time each year. Once the hen is physically capable of laying eggs, average daily temperatures stimulate serious nesting attempts.[62] If daily temperatures average above 32° F. during the 3 weeks after egg-laying begins, hens will nest early and overall production that year is above normal. If daily temperatures during this period average below 32° F., nesting is delayed and production is below normal.

Combinations of temperatures, humidity and amounts of precipitation also

influence pheasant production. Pheasant eggs should be incubated at about 100° F temperature and 85 percent relative humidity.[63] If either the temperature or the humidity departs too far and too long from these norms, the embryos will die. Low humidity causes the egg membranes to dry and toughen so that the young may not be able to emerge from the eggs.

Eggs which have not been incubated, or those in early stages of incubation, are quite resistant to cold and moisture.[64] Unincubated eggs can withstand 10° F temperatures for 2 hours. As the embryos of incubated eggs grow larger, they become less resistant to cold. At air temperatures of 32° F, eggs incubated 5 days can stand about 15 hours exposure; after 22 days of incubation, just before hatching, they can withstand 32° F for only 3 or 4 hours. Since hens leave the nest for only brief periods to feed, eggs are usually not exposed long enough to harm them. Exposure to rain or flooding reduces the time that eggs can resist low temperatures. Sixteen-day eggs can survive an air temperature of 60° F for about 30 hours, but a 60° F rain for only 10 hours.

Young chicks are much more vulnerable to low temperatures than are the eggs.[64] Exposure to 45° F air for 1 hour is fatal to some newly hatched chicks, and 3 hours is fatal to all chicks. Thus a prolonged period of cold rain or snow, occurring during the peak of the hatch could cause heavy losses of young. However, the pheasant hen is a solicitous mother and successfully protects her young from all but unusually severe or prolonged adverse weather by brooding them under her sheltering body.

Summer hailstorms, depending on their intensity and duration, can be

At least 175 pheasants can be counted in the shelter of this willow-cattail slough.
—(Photo by R.J. Fischer)

hazardous to both adult and young pheasants. Large hailstones can fracture a pheasant's skull.[65] Local pheasant populations, depressed by a severe hailstorm, rebound after the following year's production[66] and by pheasants moving in from nearby unhailed areas.

Deep, persistent snow cover appears to be the chief single climatic factor that pheasants cannot tolerate. The northward distribution of pheasants in Ontario is bounded by the 50-inch annual snowfall line and most of the major pheasant producing areas in the United States have an annual snowfall averaging only 20 to 40 inches. Some east-slope pheasant areas in Montana average 50 or more inches a year, but the snow does not stay long because of frequent chinook winds. Heavy snowfall combined with high winds can be disastrous to Montana's pheasants in areas where winter cover is scarce. Pheasants survive these storms only in protective cover of the highest quality.

Weather conditions also affect farming activities and thereby indirectly affect pheasant numbers. An early, warm spring stimulates farmers into outdoor activities and pheasant hens into early nesting. Weedy areas and borrow pits chosen as nest sites might be burned as the farmer "cleans up" his farm. Pheasant nests in grain stubble face destruction as early cultivation begins. Early alfalfa growth, which encourages pheasant nesting in these fields, may be cut earlier with subsequent nest destruction and hen mortality.

In the past we have not considered man-modified weather as feasible or desirable. Recent attention to experimental cloud-seeding, however, could result in significant alteration of the pheasant's environment. Timing of cloud-seeding could improve or detract from that environment. Man-caused rainfall during the fall or early spring could improve nesting and brood cover. However, such rainfall during the peak of pheasant hatching could depress local pheasant production. No pheasant-oriented benefits are foreseen by increasing snowfall through cloud-seeding, except perhaps during extended drought conditions.

Influencing Factors

Environmental factors which contribute to or detract from overall pheasant abundance concern the cover, food and water requirements of pheasants. These factors usually are the result of human activities and are usually long-term in their effects on pheasants. Since habitat requirements of pheasants are met primarily on privately-owned farmland, *how a landowner uses his land can make or break a pheasant population!*

Fallowing grain stubble temporarily removes food and cover, but the next year's grain crop will replace these requirements. If the fallowed stubble represents the only readily available food source (adjacent to protective cover), pheasant numbers may be held at lower levels than if grain is available each year.

Spring burning of grain stubble, irrigation ditchbanks, borrow pits, railroad rights-of-way, and agriculturally idle areas removes important early *undisturbed, residual* nesting cover. Fall burning or plowing of grain stubble destroys any degree of protective cover afforded a pheasant seeking food.

Domestic livestock grazing of shelterbelts lowers their cover value for pheasants; prolonged or heavy browsing of these woody plantings can eventually kill the shelterbelt. The grazing of ditchbanks and other uncultivated areas reduces

Montanans will not benefit from the pheasants which this burned nest could have produced. *—(Photo by R.J. Fischer)*

or eliminates any cover values their vegetation might have provided to pheasants.

Intentional or accidental flooding of fields with irrigation water can destroy pheasant nests during late spring and early summer.

Drainage of wetlands oftentimes removes critical pheasant nesting, brooding, roosting and protective winter cover. "Permanent" drainage structures eliminate these cover values for long periods of time. Cultivation of wetlands during dry years removes cover temporarily; usually regrowth of vegetation occurs during wet years. Land managers should recognize that some of these latter areas are traditionally "wet areas" and that cultivation during 1 or 2 out of 5 years only disturbs the soils enough to encourage growth of pioneering plants. Some of these plants may be considered undesirable invaders of adjacent crop lands. If economically feasible, it would be to the land manager's, as well as to pheasant's, advantage to maintain the "wet area" and its normal vegetative community.

Monoculture Farming

"Monocultural agriculture implies the production of a crop species over large contiguous areas, or on the same area for several years."[67]

Natural selection has allowed pheasants to adapt to slow, natural environmental changes in their eons of evolution. However, the development of monocultural farming has proceeded at too rapid a pace to allow for evolutionary adaptation. Few idle areas and little woody cover exists in monoculture regions. Pheasants trying to eke out a living in these monocultures are repeatedly disturbed by farm machinery and are doused with chemicals from the air. The survival-ability of a bird adapted to thrive in diversified farming areas is consequently severely taxed. It is little wonder that many of these ultra-efficient farm operations are pheasant-deserts!

Agricultural Chemicals

Any factor which disrupts the normal balance of an environment must, in some way, affect the organisms which inhabit that environment. We have become increasingly aware that chemical compounds applied in our environment have affected wildlife. Urban as well as rural wildlife have been influenced.

Agricultural chemicals, the most likely to affect pheasant numbers, are divided into two main groups: biocides and fertilizers. Biocides—commonly called pesticides—are subdivided into chemicals developed to control insects (insecticides), plants (herbicides), fungi (fungicides), rodents (rodenticides) and so on. Commercial fertilizers replace some of the soil nutrients which have been utilized during crop production and livestock grazing or lost through leaching and soil erosion.

All pesticides applied to pheasant habitats can affect pheasants. Pesticides, individually and collectively, represent potential limiting factors on pheasant populations in Montana. They may kill pheasants outright through direct exposure during pesticide application. Pheasants may also be killed indirectly by eating insects or vegetation which have been chemically treated. Some pesticides persist in the environment for many years following application. Some, moderately toxic to pheasants, decompose chemically to form even more toxic chemicals.[68] Some pesticides interfere with pheasant reproduction. Some alter vegetative cover

Extensive application of pesticides has resulted in widespread deterioration of pheasant-supporting areas. *(Photo by J.P. Weigand)*

so that pheasants are no longer secure and subsequently leave the area or perish in more marginal habitats. And finally, pesticides do not stay where they are applied; they are carried to other areas by the air and water[69] moving through the treated areas.

The absence of wildlife carcasses following pesticide spraying does not prove wildlife deaths have not occurred. Predators and scavengers find and consume or remove a majority of carcasses within one or two days.[70] Reduced pheasant reproductive rates or reduced pheasant habitat due to pesticides can be difficult to pinpoint locally. However, they can contribute collectively with other detrimental factors to the decline of pheasant numbers and quality of pheasant hunting.

In considering pesticide-wildlife relationships, one becomes rapidly aware that very minute quantities of chemicals are involved. Reference is frequently made to parts per million, or ppm. One part per million (1 ppm) means one drop of active chemical in each 1 million drops of the solution to be applied. One part per million may be illustrated by the addition of 1/3 to 1/2 cup of active chemical to the solution contained in an average size railroad tank car (which holds 23,450 gallons)!

Reference is also made to milligrams per kilogram, or mg/kg. This means the number of milligrams (28,400 per ounce) of active chemical eaten for each kilogram (1,000 grams) of the consumer's weight. Average weights for adult cock and hen pheasants are 1.1 and 0.9 kilograms, respectively. Thus consumption of one milligram of chemical by a small cock or large hen pheasant could be expressed at 1 mg/kg.

Insecticides

More than 50 different insecticides were recommended by the Cooperative Extension Service[71] for use in 1973 on Montana croplands, rangelands, and waters. At least 24 of these compounds pose serious threats to pheasant populations through immediate or delayed mortality or through sublethal effects:

Abate	Dursban	Methyl parathion	Systox
Aldrin	Dylox	Parathion	(demetron)
Chlordane	(trichlorfon)	Phosdrin	Supracide
Dasanit	Endrin	Phosphamidon	Temik
DDVP	Fenthion	Prophos	Thimet
(dichlorvos)	(Baytex)	(mocap)	Toxaphene
Diazinon	Furadan		Zinophos
Dieldrin	Lannate		(thionazin)
	(methomyl)		

Acute toxicity refers to the immediate effects on an animal of a single exposure to a pesticide; the time required for these effects to become noticeable is usually a few hours or days from the time of exposure.[72] The acute toxicity of chlordane (frequently applied to Montana alfalfa fields prior to its discovery in dairy products) for pheasants is about 500 mg/kg.[72] Diets containing 500 ppm chlordane resulted in 50 percent chick mortality in less than 10 days;[73] average chlordane consumption by chicks was 550 mg/kg. Endrin, applied at 9 ounces per acre, resulted in death of 20 pheasant hens and 12 chicks on a California farm.[74] While this application rate is greater than that currently recommended in Montana, consumption of only 10 mg/kg endrin has resulted in 100 percent mortality of adult pheasants within 2 days. Toxaphene applied at recommended rates to kill grasshop-

pers killed all pheasant chicks (5 weeks old) within 84 hours of application.[75] Most of the chicks ate less than 2 ounces of the contaminated grasshoppers.

Chronic toxicity refers to long term effects (which may or may not be severe) following repeated exposure to a pesticide; time lapse here may be several weeks or months.[72] Aldrin, applied at 2 pounds of granular form per acre, killed 25 to 50 percent of wild adult pheasants within 1 month of application.[76]

Chronic exposure to a sublethal (50 ppm) chlordane diet caused 50 percent pheasant chick mortality in less than 100 days. The average chlordane consumption per chick was only 170 mg/kg. Fifty percent of adult pheasants fed a 200 ppm chlordane diet died in less than 100 days; they had eaten an average 340 mg/kg chlordane. While field applications of toxaphene killed pheasant chicks quickly, adult pheasants did not die until about 20 days after eating lethal doses (200 mg/kg).[77]

Some insecticides exhibit sublethal effects on pheasants. Both 3 and 10 day-old pheasant chicks displayed nervous disorders following methyl parathion spraying at 0.3 and 0.5 pounds per acre.[78] Wild birds under these handicaps probably could not fend for themselves and would be vulnerable to predators or other stresses.

The effects of an insecticide may be transferred from the exposed pheasants to succeeding generations. Surveys following application of 2 pounds of granular aldrin per acre showed the following spring pheasant populations were severely depressed.[76] That summer 52 percent fewer chicks and an abnormally high proportion (56 percent) of broodless hens were observed. Pheasant hens fed various levels of DDT in pre-breeding season diets passed DDT into their egg yolks. This did not result in lowered fertility or egg production, but chick viability was reduced within 2 weeks.[72] Forty-seven percent of chicks hatched from eggs collected from wild pheasant nests on private-owned land sprayed with DDT died within 6 weeks of hatching compared to 27 percent of the chicks from eggs collected from an untreated area.[74] In this latter study also, percentages of crippled chicks from eggs from the treated area was 25 percent compared to 13 percent on the untreated area. Dieldrin fed to pheasants at 25 and 50 ppm resulted in reduced egg production and poor chick survival.[72] Pheasant hens fed dieldrin at the rate of 2, 4 and 6 mg per week during the breeding seasons suffered no mortality but when dieldrin was fed to their offspring (hens only) at any level above 4 mg, significant mortality occurred.[79]

Polychlorinated biphenyls, or PCB's, are most frequently used in industry in protective coatings like plastics, in waterproofing compounds, hydraulic fluids and other similar uses.[80] They are released into the environment during disposal (burning or flushing) of the parent materials. Some PCB's are used to extend the effective killing-life of insecticides such as DDT and lindane. While the extent PCB's are used with agricultural insecticides is not yet known by wildlife biologists, some effects of PCB's on pheasants have been investigated. Breeding season diets containing up to 50 mg PCB's resulted in death of only 2 of 40 adult pheasants. However, the 50 mg diet fed to hens resulted in significantly lower egg production, lower hatchability of eggs and lower chick survival.[81] Abonormal chick behavior was also noted.

Herbicides

Many herbicides used in Montana are much less toxic to pheasants than insecticides. Naphthas, dinitro compounds and endothal are, however, extremely toxic to

Present farming technology does not permit weed growth in grain fields like that found on this early 20th Century farm near Havre. *—(Courtesy of Montana Historical Society)*

warm-blooded animals.[82] Amitrol, barban, dalapon and triazine users are cautioned to restrict livestock grazing following treatment or to refrain from crop production for specified periods after treatment. These are human health precautions but pheasants (which cannot be restricted from treated areas) might pass these contaminants on to a hunter and his family.

The popular 2,4-D and 2,4,5-T (weed and brush killers) were found to contain minute quantities of impurities which produced birth defects in experimental animals.[83] Methods of removing this impurity are currently being researched. In the meantime, 2,4-D is still commonly used throughout Montana.

Wildlife losses due to herbicides are chiefly indirect as a result of loss of habitat. Herbicide applications remove vegetation which provide pheasants and other wildlife with food and cover. Pheasant foods in Montana include seeds of at least 77 species of plants commonly considered "weeds".[28] These plants also harbor insects important in the diet of young chicks and provide shelter for both young and adult pheasants.

Montana's Weed Law of 1969, while aimed at controlling a few noxious weeds, grants power to County Commissioners to declare any plant in Montana a noxious weed subject to control programs. *Extreme* caution must be used by these elected officials lest they declare eradication of valuable vegetation components of the remaining habitat in Montana.[84]

Carriers

Problems occasionally arise from the type of pesticide carrier employed. Pheasant eggs sprayed (on one side to stimulate field application) with No. 1 diesel fuel oil resulted in complete embryo mortality.[85] Oil-base carriers should not be used in areas where pheasants are nesting.

Fungicides

Chemicals used to control fungus pests (e.g. grain smuts and rusts) are called fungicides. Some of the most effective fungicides are compounds of mercury. Mercury is a normal component of our environment and readily combines with carbon to form organic mercury. Organic mercury, which forms naturally in the environment and artificially through chemical processing, passes easily through plant and animal cell membranes. It accumulates in living tissues and can reach toxic proportions. Instances of human poisoning from eating mercury-contaminated food have resulted in damage to the brain, liver, and other vital organs, and death; mercury can be passed from pregnant women to their fetuses.[86] [87]

Mercury is considered so dangerous to human health that the World Health Organization (WHO) established a tolerance limit of only 0.05 ppm mercury in food for human consumption.[88] The U.S. Department of Agriculture (USDA) established "zero" tolerance for mercury in food for humans but in 1969 interpreted this as levels higher than "background" (soil) levels. Mercury up to 0.10 ppm should be considered normal background levels.[89]

Discovery of mercury in pheasants in Alberta in 1969 prompted Fish and Game Department concern for similar contamination of Montana pheasants. Mercury levels in 15 pheasants collected east of the Continental Divide in Montana during September and October, 1969, ranged up to 0.47 ppm (Table 2); two-thirds of the birds contained more than the 0.05 ppm mercury tolerance limits by WHO and 7 birds exceeded the USDA "zero" tolerance limits. Montana hunters were advised by the State Health Department to limit pheasant consumption. Twenty-two additional pheasants were tested during October-November, 1970; mercury levels ranged up to 0.67 ppm. Four of these birds exceeded WHO and USDA tolerances.

In 1970, the U.S. Food and Drug Administration established a mercury tolerance limit of 0.50 ppm in foods for humans.[92] Thus all but 1 of the 37 Montana pheasants tested were "safe" for human consumption.

The effects of mercury on pheasants depend on the amount consumed and length of exposure. Birds fed a dit of methylmercury-treated wheat died in 29 to 61 days.[90] Poisoning resulted in degeneration of the nervous system which was symptomized by lack of muscle coordination and abnormal behavior. Symptoms did not appear until the 27th day after poisoning began. Chronic mercury poisoning also depresses pheasants' reproduction. Shell-less eggs may be laid which are broken or eaten by adult pheasants, and hatchability of all eggs is reduced.

The source of mercury contamination was found to be seed-dressings containing methylmercury (found in Panogen and Ceresan). These dressings had been used by seed companies and farmers for a quarter-century to protect seed-grain, particularly wheat and barley, from fungus attacks. Pheasants, and other birds, picked up the treated seed after it was spilled during hauling or planting and where surplus treated seed was dumped in borrow pits and other idle areas.

The use of mercury seed dressings is being discontinued in the United States. Sudden nationwide publicity of mercurial poisoning of members of a New Mexico family prompted USDA-suspension of methylmercury fungicide seed treatments in February, 1970. Seed dealers and farmers were permitted to use existing supplies of Panogen and Ceresan but no additional supplies could be imported into Montana.

Table 2. **Mercury levels[A] in breast muscles of Montana pheasants, 1969 and 1970.**

Region	September - October, 1969			October - November, 1970		
	No. Pheasants Sampled	Average Mercury in PPM	Mercury Range in PPM	No. Pheasants Sampled	Average Mercury in PPM	Mercury Range in PPM
1 - Northwest	0			5	0.12	<0.01 to .36
2 - Westcentral	0			2	- -	0.01 to .02
4 - Northcentral	[B]			5	0.15	<0.01 to .67[C]
5 - Southcentral	5	0.23	<0.05 to .47	5	0.03	<0.01 to .11
6 - Northeast	5	0.19	0.09 to .38	5	0.02	<0.01 to .04
7 - Southeast	5	0.11	<0.05 to .31	3	- -	<0.01 to 0.03[D]

[A]Mercury levels in 1969 were determined by the Wisconsin Alumni Research Foundation (Madison); in 1970 by the U.S. Food and Drug Administration (Denver, Colorado).

[B]Five Hungarian partridge contained an average 0.19 PPM mercury (range = 0.07 to .30) in their breast muscles.

[C]Juvenile male with mercury-treated (dyed) grain in his crop contained 0.67 PPM mercury in his breast muscles.

[D]Two juvenile females contained no detectable mercury.

Investigations by Montana Department of Agriculture personnel in 1973 revealed a few dealers had mercury seed dressings available but most had begun supplying non-mercury fungicides.[91]

The continuous development of new fungicides will require periodic evaluation of their various effects on pheasants and other wildlife. Cadminate, Phygon (dichlone), Vapam (metham sodium) and Zineb fungicides are acutely toxic to young pheasants only at very high levels of consumption.[93] Captan is acutely toxic to young pheasants only in very high doses but questions regarding possible human health hazards remain unanswered.[94] Nabam and Thiram are acutely toxic to young pheasants at levels somewhat higher than mercury fungicides.[95] Effects of these non-mercury fungicides on pheasant behavior and reproduction, however, are yet to be explored.

Pesticide Use in Montana

Records of early pesticide use in Montana are sketchy. In the United States (assumably Montana follows the national pattern) some insecticides and fungicides were used on farmlands during the 1930's. The discovery of the insecticidal properties of DDT in 1939, followed by World War II and an increased demand for food and fiber, apparently triggered the widespread acceptance and use of pesticides. Synthetic pesticide production in the United States increased over 500 percent from 1947 (124.3 million pounds) to 1960 (637.7 million pounds)![96]

In Montana, experimental use of herbicides for weed control started in the early 1940's and were in common use by 1944.[97] By 1951, over half of Montana's wheat acreage was chemically treated to control weeds. It therefore appears that pesticides "came into their own" in Montana during the 1940's. Interviews of 41 of 500 Montana pesticide dealers in 1969 indicated sales of 22,583 gallons and 53,542 pounds of insecticides and 506,786 gallons and 134,563 pounds of herbicides.[98] Amounts of pesticides sold during years of high pheasant numbers are unknown but 1969 sales presumably represent a significant increase in pesticide use in Montana since the early 1940's.

The peaking of pheasant numbers in Montana in the late 1930's and early 1940's, a period of limited pesticide use, and the 1950-to-present pheasant decline, a period of accelerated pesticide use, seems more than a mere coincidence. While pesticides are not considered the sole deterrent to maintaining higher pheasant populations, they can hardly be regarded as blameless. Pesticides are only one tool, of many, used in the overall intensified management of farmlands since the 1940's. Some specific recommendations for land managers regarding the use of pesticides are presented in Appendix I.

SUMMARY

Pheasant studies in Montana and elsewhere show they possess certain unique characteristics. Breeding, nesting, brooding and survival activity patterns have evolved through eons of time. This evolution included the adaptation of pheasants to existing natural and early man-modified communities. These communities were composed of vegetation or cover types in which pheasants could perform their daily

and seasonal activities. Predators were also an integral part of these communities and the fact that the pheasant species survived indicates they successfully adapted to losses through predation. Pheasants also adapted to a wide range of weather but extreme conditions still take their toll of pheasant populations.

Habitat requirements of pheasants include specific vegetation communities for cover and food. These communities must lie in close proximity to one another in order to benefit pheasants. In Montana, undisturbed, residual cover for nesting and heavy cover for protection during the winter are critical. Food, in the form of waste grain, "weed" seeds, and insects, must be abundant and close to protective cover.

Pheasant populations are checked in nature by predation, accidents, parasites, diseases, weather and other mortality factors. None of these mortality factors are capable, however, of reducing pheasant numbers below the security threshold of their habitat; this assures survival of the overall pheasant population. Security thresholds for pheasants are determined largely by land uses and management practices.

Emphasis of a large segment of our society (farmers and ranchers are now a minority group of our society) is toward further land development and the maintenance or increase of our present standard of living. The individual land manager is, therefore, caught between the economic demands of society and, at the same time, society demands for the preservation of wildlife (pheasants in this discussion). Proposals for alleviating some of these society-imposed pressures are presented in Chapter 5.

3

PHEASANT MANAGEMENT IN MONTANA

Game management is the art of making the land produce a sustained annual yield of game for sport hunting[22] and other recreational enjoyment. It consists largely of identifying limiting factors and controlling them.

Early management efforts emphasized restrictive hunting regulations, predator control, establishment of refuges and game farm stocking or transplanting wild animals. By the mid-1930's, far-sighted conservationists recognized that fundamental knowledge about ecology and habitat requirements for individual game species was necessary for their perpetuation.

The Pittman-Robertson Act of 1937 provided funds for game research, land acquisition and habitat development nationwide. This act levied a 10 percent (now 11 percent) federal excise tax on sporting arms and ammunition. The tax collections are apportioned back to the states based on the state's area and number of hunting licenses sold. During the 25-year period, 1946-70, Montana's game management programs received almost $11 million from these taxes. The act provided state fish and game departments with $75 for each $25 the departments spent on approved programs. Since the 25 percent provided by the Department comes from the sale of hunting licenses, *hunters finance the entire program* and no tax money from Montana's general fund is used!

One of the first studies funded under the new Act concerned the relationship of pheasants to agriculture in southcentral Montana. This, and similar studies throughout the country, illustrated the pheasant's dependence on farm land for existence. Most lands inhabited by pheasants are privately-owned, thus most pheasants depend directly on the farmer.

Pheasant management by the Montana Department of Fish and Game consists of monitoring pheasant population trends, providing recreation to hunters, improving habitat on Department-owned lands, recommending habitat improvements on public and private lands and stocking pheasants raised on the single Department-owned game farm.

POPULATION SURVEYS

An important phase of pheasant management is conducting population surveys during the four seasons of the year. Survey results indicate population levels and production success. Comparison of one season's results from year to year show population trends. Survey data are most useful when supplemented with information on habitat changes and weather. Combining all of this information permits biologists to interpret what is happening within and to pheasant populations in the state, i.e. they are able to define factors limiting pheasant numbers.

No attempt is made to count entire pheasant populations anywhere in Montana! Since pheasant numbers in similar habitats respond in approximately the same manner to similar farming practices, predation and hunting, and weather, seasonal surveys are designed to *sample* populations in various areas of the state. Considerable care is exercised by biologists in selecting representative pheasant populations and in conducting standardized surveys. Only those surveys which yield the highest quality data are employed; surveys are periodically evaluated and are improved when necessary.

Population surveys in the 1940's involved recording pheasants seen during mid-or late summer along routes established throughout the state. Combined results of these route-surveys for 1941-52 are presented in Figure 3.[99] The Montana pheasant population "crash" in the mid-1940's is well documented in these surveys; similar pheasant declines occurred throughout the United States at this time.

Figure 3. **Fall pheasant population trends in Montana's early major pheasant producing areas*, 1941-53.**

During the mid-1940's, three Montana biologists compared results from pheasant roadside censuses within Montana and from other states.[100] They found that accuracy of this technique was influenced by various degrees of dew formation, the presence or absence of rain and snow, time of the day, and sex and age of

*Results are combined from surveys in the following areas: Billings, Chinook, Conrad, Fairfield, Flathead Valley, Glasgow, Hamilton, Hardin and Sidney.

pheasants. They concluded that unless the surveys were conducted under specific weather conditions, during certain times of a season and often enough to be reliable, it would be better not to conduct the surveys at all. Some pheasant populations in Montana are still surveyed by roadside census techniques but surveys are limited to those times and conditions when comparable results can be obtained. The spring crowing cock survey has replaced roadside surveys for yielding more reliable pheasant population indices.

During April-June, biologists conduct crowing count surveys in selected pheasant ranges. Each survey is made on a 19-mile vehicle route with listening stops at 1-mile intervals. At each stop, the observer counts the number of crowing males heard for a 2-minute period. Pheasant cocks rarely crow more than once during this time[101]. The survey is begun one-half hour before sunrise and requires about two hours to complete. The average number of crowing calls heard per stop provides an index to cock pheasant abundance during the breeding season. Information resulting from these surveys is presented in Chapter 4.

Summer surveys consist of brood counts to determine production success and roadside counts to "census" pre-hunting season populations. Research has shown that pheasant broods are most observable after they are four weeks old; younger broods stay close to concealing cover.[17] Since most broods hatch by late June, the majority of the young attain this age in early August. By late August, many farm crops (though not corn, sugar beets and some hay) have been harvested and broods have less cover in which to hide. Thus biologists make brood surveys along established routes in August and early September each year. Often these are the same routes used for spring crowing counts. Each route is traveled at slow speed starting 15 to 30 minutes after sunrise. Each group of pheasants observed is flushed and counted. Biologists often use bird dogs to flush birds, thereby obtaining a more accurate count of the birds present.[102]

Each brood is aged to the nearest week by noting plumage development and coloration of the young.[103] Brood ages show the time of hatching and enables biologists to recommend hunting season opening dates to conform to the development of the young birds. Knowing the time of hatching also permits comparison of hatching dates with events which affect pheasant production such as farming activities and unusual weather conditions.

Pheasants observed at random during other field activities are also flushed and counted. Data from these observations supplement the route data.

Roadside counts are made in late summer in conjunction with brood surveys. The number of pheasants or broods seen per mile of route provides an index to relative pheasant abundance.

Winter is the best time to conduct sex ratio surveys of pheasants. Snow and cold cause the birds to concentrate in areas of good food and cover. Biologists then survey these pheasant ranges, recording the numbers of cocks and hens they observe. Pheasant sex ratios in Montana average about 30 cocks per 100 hens. In some heavily hunted areas there may be only 20 cocks per 100 hens while in lightly hunted areas cocks and hens may occur in nearly equal numbers. The proportion of cocks has always been more than adequate to assure maximum egg fertility the following spring.

Winter is also a good time to evaluate pheasant habitat. Several inches of snow covering mowed hay fields, plowed grain fields and heavily grazed pastures emphasizes the bleak outlook for pheasants in many areas.

HUNTING AND OVER-HUNTING

The reasons for hunting pheasants are possibly as numerous as numbers of pheasant hunters. Among the most popular reasons are the enjoyment of outdoor activities, recollection of past hunting experiences and hopes to add new ones, anticipation of unexpected pheasant flushes, good shooting and the high palatability of pheasant on the family table.

"Over-hunting" has been defined as the reduction of numbers of effective breeders, hence a lower population, the following year as a direct result of shooting.[104] Hunters remembering lean game years of the early 20th Century and the not infrequent game population crashes are still haunted by over-hunting fears. Doubtless too, most true hunters today abhor the thought of having been responsible for the future demise of Montana's pheasants. Much of the nation's early research has shown these anxieties are unfounded when it comes to pheasants.

Pheasant cocks are seldom, if ever, over-harvested by legal hunting. Any area will produce so many pheasants and hunters will kill only a limited percentage of these regardless of hunting pressure. During a 6-year study in good Michigan pheasant habitat, hunters (far more numerous than in Montana) harvested between 49 and 76 percent of pre-hunting cock populations.[104] Hunting pressure and total cock kill were determined by the pre-season populations during population "high" and "low" years (Fig. 4).

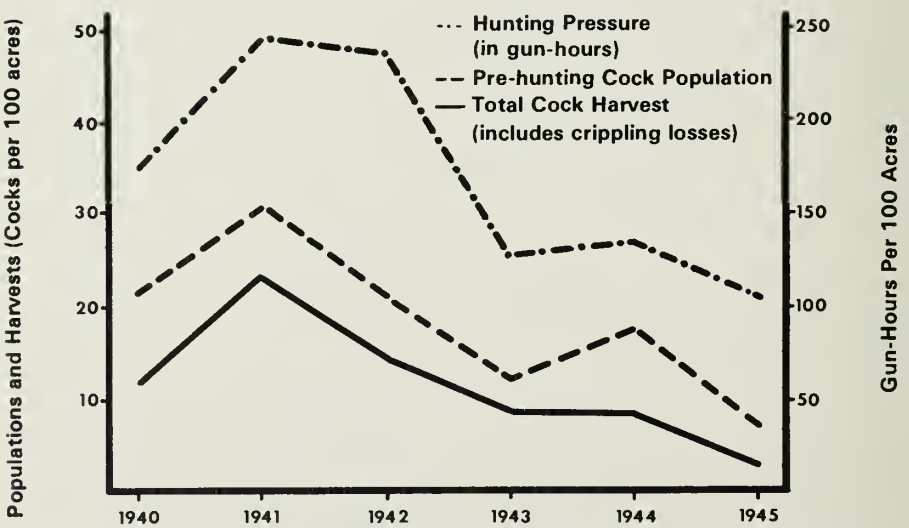


Figure 4. **Pre-hunting season cock pheasant populations, hunting pressure, and cock harvests at Rose Lake Wildlife Experiment Station, Michigan [104].**

The Michigan study also showed that 48 to 66 percent of the hunting pressure and 64 to 88 percent of the harvest were obtained during the first week of the hunting season.[104] Check station results from the Flathead and Bitterroot Valleys and the Fairfield Bench-Conrad area in Montana paralleled Michigan's data. In Montana, over 60 percent of the hunting pressure occurred on opening day and over 70 percent of the total pheasant harvest was taken opening day (Table 3).

Table 3. **Numbers and percentages of hunters interviewed and numbers and percentages of pheasants examined at three Montana check stations.**

Check Station Locations	Year	Hunters Interviewed			Pheasants Examined		
		Season	Opening Day		Season	Opening Day	
		Total	No.	%	Total	No.	%
Flathead Valley	1948	856	480	56	1,042	705	68
	1949	2,917	1,944	67	4,420	3,867	87
	1950	1,749	1,203	69	2,274	1,530	67
	Totals	5,522	3,627	66	7,736	6,102	79
Bitterroot Valley	1948	631	318	50	427	216	51
	1949	426	248	58	291	201	69
	1950	354	142	40	352	109	31
	Totals	1,411	708	50	1,070	526	49
Great Falls (West of)	1948	2,562	1,295	51	4,098	2,527	62
	1949	2,856	1,927	67	5,031	3,904	78
	1950	1,668	1,075	65	2,352	1,639	70
	Totals	7,086	4,297	61	11,481	8,070	70
Grand Totals	1948-50	14,019	8,632	62	20,287	14,698	72

Collectively this information indicates pheasant hunting pressure on any given area reaches a *points of diminishing returns.* Once this point is attained, hunters seek another hunting area in which to hunt, hunt other game species, or hang up their shotguns until next year's opening day. Disregarding variable weather conditions during the hunting season, there appear to be several reasons underlying this phenomenon:

1. a majority of the pre-hunting season pheasant population is vulnerable, juvenile birds, ignorant of the potential consequences of the hunting season;
2. birds, young and old, which survive the opening "baptism of fire" become harder to bag; and
3. the pheasant population decreases as the hunting season progresses.

HUNTING REGULATIONS

Since the first Montana pheasant hunting season in 1928, regulations have become more liberal. In recent years seasons have been about one month long and

have included either sex bag limits in some areas. Liberalizing hunting seasons has been an important benefit of the accumulating knowledge from pheasant research. Discovery that pheasants harvested through sport hunting are part of the annual surplus (i.e. replaces part of the natural mortality) reassures hunters they are not harming succeeding pheasant populations. Montana's pheasant hunting regulations, 1928-73, are presented in Appendix II.

Opening Dates

The opening date of the pheasant season depends on several things, among them is the stage of growth of young birds. The time of year when pheasants are in greatest numbers (in June) might seem to be the time to harvest them. However, since most young pheasants are just hatching it is unlikely they would be considered much of a trophy. Young pheasants reach adult size at about 20 weeks,[12] [105] so the opening of the season is delayed until a majority of the chicks are about this age. Opening dates, based solely on pheasant hatching time, could vary from early October to early November.

Since natural mortality continues year round, the pheasant hunting season should open sufficiently early to take advantage of surplus birds. More of the annual pheasant crop is available to hunters with a mid-October than a mid-November opening date.

Agricultural crop harvesting is also considered in setting the opening date of pheasant season. Virtually all of Montana's wheat and barley crops are harvested before October 1. Corn and sugar beet harvest, however, occur well into October. By opening the hunting season in late October, conflicts between pheasant- and corn-harvesters are minimized.

Montana traditionally opened its pheasant season on a Sunday until 1968. This gave the 6-day working people equal opportunity to share the opening day with those who work a 5-day week. A survey of 38 states and 4 Canadian provinces having pheasant seasons in 1963 showed 50 percent had Saturday openings.[106] Only 6, including Montana, had a Sunday opening. During 1968-71 Montana moved out of this minority rating and permitted her hunters to enjoy an opening weekend of pheasant hunting.

The reversion to a Sunday opening in 1972, combined with the joint opening of the general big game and pheasant seasons, has had a depressing effect on northcentral Montana's pheasant hunting. During 1969-71, opening day (Saturday) hunting pressures on a Teton County study area averaged 0.81 hunters per square mile; on opening day in 1972 (Sunday), hunting pressure dropped to 0.50 hunters per square mile (down 38 percent) and in 1973 there were only 0.22 hunters per square mile (down 56 percent) (Table 4).

During 1968-71 (Saturday openings), hunters statewide harvested between 90,643 and 114,528 pheasants annually. In 1972 the annual statewide harvest dropped to 68,138 pheasants and in 1973, 66,314 pheasants were harvested. While these declines could indicate habitat deterioration or reinstated cocks-only hunting seasons, they could also reflect less hunter interest in pheasants due to the big game season openings. If this latter reason is valid, continued simultaneous general big game and pheasant season openings could further reduce hunter interest in

Table 4. **Hunting pressure on a 54-square mile study area in Teton County, 1969-73**[52 107 108 109]

Year	Opening Day(s)	Number of Hunting Parties	Number of Hunters	Hunters Per Square Mile
1969	Saturday*	12	27	0.50
	Sunday	- -	- -	- -
1970	Saturday*	19	46	0.85
	Sunday*	6	19	0.35
1971	Saturday*	25	59	1.09
	Sunday*	7	16	0.30
1972	Sunday	12	27	0.50
	Monday**	2	6	0.11
1973	Sunday	6	12	0.22

*Results of aerial surveys; remainder are ground surveys.
**Veterans Day.

Montana's No. 1 farmland game bird. With little or no hunter interest in pheasants, hunters would become less aware of pheasant habitat deterioration. Carrying this point to a potential conclusion, a resulting elimination of habitat would result in hunters and other Montanans having no pheasants to be concerned about!

It has also been traditional to open the pheasant season at noon the first day in Montana. The 1963 survey[106] revealed Montana was again in the minority of states and provinces embracing the "noon opener". About one-fourth of them opened the season one-half hour before sunrise while 50 percent started seasons no later than one-half hour after sunrise. The pheasant season is the only fall hunting season in Montana which opens at noon; all others open one-half hour before sunrise. The noon opening has been maintained in response to landowners' wishes.

Season Lengths

The first pheasant season in Montana was two days long. It represented the state's shortest open season. The longest statewide season was 37 days in 1969. A closed season was decreed in 1946, following the 1945-pheasant population crash.

The effect of hunting season length on a pheasant population is insignificant. More than two-thirds of the annual harvest takes place the opening day or weekend of the season. The remaining third of the harvest is distributed over the remainder of the season whether it is one week, one month or three months long.

A longer season provides additional recreational opportunity for those who really enjoy pheasant hunting. Hunters in some states have been enjoying long hunting seasons for several years; Nebraskans pursued the favored ringneck for 93

days each year during 1963-66, and seasons in excess of 60 days have been in effect since the late 1950's. Their pheasant populations fluctuated up and down in response to habitat and climatic influences—not hunting. Montanans could also have longer pheasant seasons, if they wanted them.

Daily Bag Limits

The popular belief that daily bag limits are set to correspond to pheasant population levels is a misconception. The main purpose of a daily bag limit is to distribute the pheasant harvest more evenly among participating hunters. Hunters usually average only a pheasant or two on opening day regardless of the bag limit. More hunters achieve satisfaction with a low bag limit than with a high one. Since the Montana Department of Fish and Game must provide sport for the majority of hunters, bag limits tend to remain low.

Possession Limits

Attempts to curb market hunting decades ago resulted in establishment of possession limits of various game species. By limiting hunters to one or two daily bag limits in their possession, enforcement officials could apprehend persons transporting larger quantities of game for market. Limiting Montana hunters to a 2-day pheasant bag in possession probably inconveniences them little. There would be little consequence to the pheasant population if hunters were permitted to possess larger numbers of birds.

HEN SHOOTING

If Nature had colored pheasant cocks and hens similarly, as she did the sexes of Montana's five grouse and two partridge species, there would be little or no controversy concerning hen pheasant shooting. Hunters would have been happily harvesting hens since 1928!

Department biologists have recommended various types of hen harvest regulations to the Fish and Game Commission and Montana hunters since 1959. Major reasons for this recommendation were:

- — average annual mortality of pheasants with or without hunting, is 60 to 70 percent;
- — a percentage of hens in autumn is surplus to maintaining the next year's pheasant population;
- — Montana lacks the hunting pressure necessary to harvest the entire annual surplus of pheasants, cocks or hens.

Before reopening the legal shooting of hens in 1959 (hen shooting was allowed in 1942 and 1943), studies of pheasant population dynamics and effects of hen harvests on succeeding populations in other states were evaluated. On a Wisconsin refuge, where absolutely no hunting was allowed, annual pheasant mortality was 81 percent.[6] Only 19 percent of the cocks and hens survived from one year to the next.

In California, 18 years of limited hen shooting were allowed and more wild hens were killed than cocks;[110] yet, no measurable decreases in pheasant populations occurred. Annual mortality of hens remained at 65 percent before and during hen

shooting. In other words, hunting mortality was substituted for part of the nonhunting mortality. This study indicated that up to 45 percent of the annual fall hen population could be harvested by hunters without endangering reproduction.

A recent Washington study[111] showed 6 to 12 percent of the fall hen population was legally harvested by hunters but an additional 33 to 39 percent died before the following spring.

The Montana Fish and Game Commission reinstated limited hen shooting on an experimental basis near Fairfield (Teton County) in 1959 and near Kinsey (Custer County) in 1960. The Fairfield area was studied carefully because of its proximity to a larger hunter population. The 2-year study[112] was conducted 35 miles northwest of Great Falls on the Sun River Irrigation Project, an area known locally as the Fairfield Bench. One hen was allowed in the 3-bird daily bag during the first eight days of the 29-day seasons. A tag was attached to each bagged hen by check station personnel and it was unlawful for hunters to remove untagged hens from the hen-harvest study area. A second irrigation project, 35 miles northeast of Fairfield Bench, was a control area where cocks only (three per day) shooting for 29 days was allowed. Hunting seasons opened the same day on both areas.

Winter surveys following these hunting seasons indicated more hens per cock in the cocks-only area. Higher breeding populations (cocks and hens) were found on the cocks-only area each spring. Summer surveys, however, indicated larger broods in the hen-harvest area. The number of young per mile and total birds per mile was slightly greater in the hen harvest area.

Examination of hunter-killed birds at check stations showed higher juvenile cock per adult cock ratios in the hen-harvest area. This supported conclusions about larger broods found during summer surveys on the hen harvest area. Check station data also revealed hunters averaged more birds per hunter and spent less time bagging each bird than hunters in the cocks-only area.

Hunters stopping at Montana Fish and Game Department checking stations provide valuable hunting success and bird production information.

—(Montana Dept. of Fish & Game Photo)

The proportion of hens harvested from the Fairfield population was unknown, so California's "safe ceiling" of 45 percent hen removal could not be tested directly. A Utah study suggested knowledge of relative hunting pressure could be used to approximate proportions of hens harvested. In Utah, hunting pressure ranged from 40 to 50 hunters per square mile during limited fall hunting of hens.[113] In 1961 (one hen allowed per hunter for the 9-day season), 7 to 10 percent of the hens were harvested during the fall season. Limited data in 1962 (one hen per day during the 9-day season) indicated an estimated harvest of 35 to 40 percent of the available hens. In 1963 (one hen per day during the last three days of the 5-day season), more reliable data showed 7 to 24 percent of the hens were bagged.

Based on Utah's findings, it would have taken more than 5,500 hunters during the 8-day hen season to harvest approximately 25 to 35 percent of the available hens from the Fairfield Bench. During the opening day, Fairfield area check stations reported 1,131 hunters in 1961 and 1,290 hunters in 1962. An earlier study in the Fairfield-Conrad area showed 50 percent of the season's hunting pressure on pheasants occurred opening day[114]. While approximately 68 percent of upland game bird hunters stop at voluntary check stations[54], the percentage of hunters stopping at Fairfield check stations was probably greater because of the hen-tagging regulation. Thus, the estimated total number of hunters (3,325 in 1961 and 3,795 in 1962) was insufficient to harvest about 25 to 35 percent of the available hens.

It is highly improbable that the hunting pressure or proportions of hens harvested in Utah has been experienced in Montana. It is even more improbable that the proposed 45 percent "safe ceiling" harvest of hens has been—or can be—attained in Montana under existing hunting pressure.

Results of the Fairfield study demonstrated hens could be harvested with no measurable adverse effects on pheasant populations in Montana. So, legal shooting of hens was gradually allowed in other parts of the state. Southeastern counties progressed to 3-bird either sex daily limits during 1962-67. During 1969-72, one hen was allowed in the daily 3-bird bag limit throughout the state with two small exceptions; cocks-only hunting was allowed in part of Yellowstone County in 1971 and 1972 and in Lake County in 1972. In 1973, one hen was permitted in the daily 3-bird bag in 34 entire counties and portions of 2 other counties.

Long-term investigations in Montana show pheasant populations are maintained in areas with full season, either sex daily bag limits. Check station data from 1955-70 in southeastern Montana along the Yellowstone River Valley and its tributaries from Forsyth to Glendive showed hunting success fluctuated noticeably (Table 5). During 1955-59 cocks-only season hunters were less successful (average of 107 birds per 100 hunters) than hunters during the first 5 years, 1960-64, of hen shooting (average of 115 birds per 100 hunters).[115] The highest recorded success in 16 years was in 1963 and occurred after two years of either sex seasons. The second highest success occurred in 1968 after 6 years of either sex shooting and only 4 years after pheasant populations were almost eliminated during the 1964-65 winter.

Hens, representing the actual base of pheasant breeding populations, could be justifiably referred to as "sacred". Conversely, a certain portion of the hens are annually "surplus" to population maintenance. Harvesting part of this surplus is a biologically sound facet of Montana's pheasant management program.

Table 5. **Pheasant hunting success and daily bag limits in southeastern Montana, 1955-70.**

Year	Pheasants per 100 Hunters[A]	Daily bag limits
1955	135	3 cocks
1956	76	3 cocks
1957	112	3 cocks
1958	128	3 cocks
1959	79	3 cocks
1960	98	3 cocks; 3 birds total, 1 hen allowed per day[B]
1961	95	3 cocks; 3 either sex[B]
1962	123	3 either sex
1963	164	3 either sex
1964	94	3 either sex
(Extremely severe winter, 1964-65)		
1965	59	3 either sex
1966	77	3 either sex
1967	121	3 either sex
1968	145	3 birds total, 1 hen allowed per day
1969	112	3 birds total, 1 hen allowed per day
1970	117	3 birds total, 1 hen allowed per day

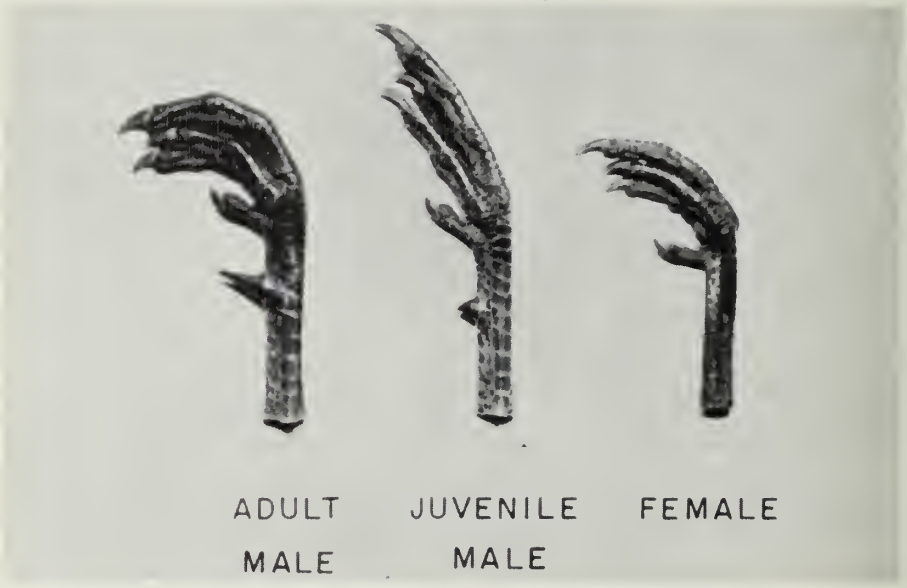
[A]Opening day check station data.

[B]Hen regulations applied during first eight days to Kinsey Irrigation Project only.

HARVEST SURVEYS

Pheasant harvest information is obtained from hunters at check stations and through mail questionnaire surveys. Check stations are operated on the opening day or weekend of the pheasant season. Until 1973 hunters voluntarily stopped at these stations; legislation passed in 1973 made stopping mandatory. Station operators interview the hunters and record numbers of hunters, numbers of hours hunted, numbers of birds bagged, area hunted and other information. They also collect a wing and the scaly portion of one leg from each bird for sex and age determination.

Prior to 1969, pheasant cocks were separated into adult and juvenile classes by examining spurs on the lower legs. Long, sharp, dark, glossy spurs indicated adult birds while short, conical or blunt, light, dull-colored spurs identified juveniles.[116]



When whole birds are available for examination, cocks and hens can be aged by measuring the depth of the Bursa of Fabricius, a cloacal pouch which grows shallower with age;[5] [116] it usually disappears after the first year.

During 1969-73 a new aging technique,[117] measuring the length and shaft diameter of the innermost primary or flight feather, was tested on harvested pheasants. Preliminary evaluation showed this method of aging is more accurate

than spur examination for cocks and inconveniences hunters less at check stations than bursal probing of hens. Department personnel may now collect wings from hunters' pheasants and examine the feathers later. Hunters, however, may still use spur aging to easily separate "fryer" from "boiler" pheasants.

Wings from juvenile birds are used to obtain additional information on hatching dates to supplement data obtained during brood surveys. The 10 primary or "flight" feathers are molted (or shed) in sequence, from innermost to the outermost, according to age. So it is relatively simple to note the stage of molt, measure the length of the newest primary and pick the age of the bird in weeks from a reference chart. Using the bird's age and dating back from the time of kill establishes the hatching date to the nearest week. Hatching distributions for counties or regions are determined by combining individual hatching dates.

Most of the pheasant harvest consists of juveniles, or birds-of-the-year, a reflection of the rapid turnover in pheasant populations. Proportions of juveniles in the harvest are presented within each region in the next chapter. By late October there must a ratio of at least four young birds per adult hen to maintain the population at a stationary level. A higher ratio of young to adult hens indicates an increasing population while a lower ratio indicates a declining population. Biologists can therefore often anticipate population trends by the proportion of juvenile birds in the harvest. If there were no hunting, an opportunity to gather information would be lost and reasons for population changes would probably go undetected.

Proportion of Hens in the Harvest

Hunter interviews at check stations, 1959-62, indicated hens averaged approximately one-third of all pheasants harvested when hen-shooting was included in the first week of the regular pheasant season (Table 6). Since daily bag limits of 3-birds allowed one hen, hunters took full advantage of the hen limitation. When hen-harvesting was permitted (one hen in daily 3-bird limit) during the last eight days of the regular pheasant season, hens averaged 59 percent of the total bag. Numbers of hunters checked the first day of the late hen season were 47 percent less than those checked the first day of the regular earlier season. Normally 80 or 90 percent of the hunters would have abandoned pheasant hunting this late in the season. The late hen season demonstrated hunters were enticed into hunting late in the season.

Crippling Losses

While the true hunter makes every reasonable attempt to retrieve "downed" pheasants, a certain proportion of birds are nonetheless lost as cripples. In this discussion crippling losses (expressed as percent) are defined as the number of pheasants hit by shot and unretrieved, divided by the total pheasants obviously hit by shot. This information is supplied by hunters at check stations and its accuracy is subject to the honesty and memory of individual hunters.

Pheasant crippling losses vary from year to year and from region to region within Montana. Hunter interviews at several check stations in Montana, 1947-53, revealed 5 to 19 percent of the pheasants obviously hit by shot were lost as crippled or unretrieved dead birds (Table 7). The average crippling loss statewide was about

Table 6. **Percent hens in the daily and seasonal harvest determined at Montana check stations.**

Hen Harvesting Allowed During:	First 8-Days[A]				Last 8-Days
Area:	Fairfield	Kinsey	Fairfield	Fairfield	Fairfield
Year:	1959	1960	1961	1962	1960
	Percent Hens in Daily Harvest				
First Day	31	34	25	32	61
Second Day	33	17	29	31	44
Third Day	34	29	26	39	40
Fourth Day	34	35	39	49	57
Fifth Day	39	38	39	33	67
Sixth Day	41	40	34	42	42
Seventh Day	46	42	36	44	63
Eighth Day	43	41	42	46	62
8-Day Average	34	36	30	35	59

[A] Season opened at noon on the first day.

12 percent during this period. Field contacts with hunters in Teton County, 1969-72, revealed crippling losses ranged from 7 to 13 percent.[108] [109] Cock losses were 10 percent in 1971 and 11 percent in 1972; losses for hens were 18 and 25 percent, respectively. The protective coloration of hens apparently contributes to difficulty in retrieving them, particularly to hunters without dogs.

During cocks-only hunting seasons, hunters invariably wound or kill some

Table 7. **Pheasant crippling losses on opening day of Montana hunting seasons, 1947-53.**

Year	Flathead Valley	Bitterroot Valley	Conrad-Fairfield	Sidney	Wolf Point
1947	- -	- -	13	- -	- -
1948	16	15	13	- -	- -
1949	10	14	- -	- -	- -
1950	12	10	12	- -	- -
1951	- -	10	- -	- -	- -
1952	12	5	8	19	- -
1953	10	5	16	19	10

Use of trained retrievers reduces pheasant crippling losses and increases overall enjoyment of the hunt. *—(Photo by R.J. Fischer)*

hens. X-ray examination of hens after hunting seasons in several midwestern states showed 3 to 7 percent carried lead shot.[118] While biologists' opinions differ as to the fate of wounded hens, certainly some of the hens die from these shot wounds.

Montana's cock-crippling losses seem to be on the lower end of the scale when compared to other states or provinces. Losses in California were 20 to 30 percent,[119] 18 percent in Michigan[11] and Ohio[120] and 8 to 23 percent on Pelee Island, Ontario.[12] This could indicate that Montana hunters are more efficient at retrieving pheasants, more reluctant to admit losses, or more forgetful than other hunters. As long as Montana hunters report losses honestly and accurately, these percentages could well reflect added determination in locating downed pheasants.

Dogs and Pheasant Hunting

Hunters with dogs are rewarded with additional memories of the hunt. For those hunters with reasonably well-trained dogs the memories will be pleasant; an untrained dog will doubtless give the hunter nightmares! The positive value of dogs in pheasant hunting was determined from interviews with 2,330 hunters during 1963-67 in northcentral Montana (Table 8). While only 25 percent of the hunters used dogs, they averaged 40 percent more pheasants per hunter and spent 22 percent less time bagging each bird. In 1968, 162 hunters indicated dog-users lost 12 percent of the pheasants shot, as cripples, whereas non-dog hunters lost 23 percent as cripples!

The assets of a good dog in pheasant hunting are obvious. In times of pheasant scarcity, hunters must make greater efforts to find live birds and retrieve those

Table 8. **Comparative pheasant hunting success in northcentral Montana: dog used vs. no dog.**

Year	No Check Stations[A]	Dog Used?	Hunters No.	Hunters %	Pheasants Per Hunter	Hours Per Pheasant
1963	3	Yes	107	16	1.2	3.3
		No	554	84	0.9	3.9
1964	3	Yes	93	21	2.0	1.7
		No	343	79	1.4	2.4
1965	5	Yes	191	31	1.0	3.2
		No	421	69	0.7	4.4
1966	3	Yes	104	30	1.3	2.7
		No	243	70	1.2	2.4
1967	3	Yes	81	30	1.8	1.6
		No	193	70	1.0	2.8
5-Year Totals & Averages		Yes	576	25	1.4	2.5
		No	1,754	75	1.0	3.2

[A] Included Brady, Coffee Creek, Denton, Power, Valier and Fairfield Bench (Simms cutoff and 13th Lane).

which are shot. The difference between successful and unsuccessful hunts during these times could be determined by whether or not the hunter uses or does not use a dog. When pheasants are plentiful, a good hunting dog only enhances the positive aspects of each hunt and may minimize at least one negative aspect—the loss of crippled or dead birds. It is, therefore, difficult to understand why only one hunter in four in Montana uses a dog while pheasant hunting.

Harvest Questionnaires

The Department of Fish and Game obtains information on statewide, regional and county harvests on pheasants and other game species from Montana hunters. Each year following the hunting seasons, a harvest questionnaire is mailed to a randomly selected group of upland game bird license buyers. Between 10,000 and 18,585 hunters were mailed questionnaires annually, 1958-73, and an average of 68 percent of the hunters completed and returned them (Table 9).

Information from the returned harvest questionnaires is expanded to determine estimates of numbers of license buyers who actually hunted and of numbers of pheasants harvested. *These projected figures are not, therefore, absolute—they are estimates.* They are most useful in determining trends.

Numbers of persons licensed to hunt pheasants and other upland game birds since 1950 peaked during 1963-65 (Table 10). Numbers of hunters then decreased through 1971 and were showing a slight comeback through 1973. During 1967-73 an average of two-thirds of the upland game bird license buyers actually hunted.

Table 9. **Upland game bird harvest questionnaires mailed and returned in Montana, 1958-73.**

Year	Number of Questionnaires Mailed	Questionnaires Returned	
		No.	%
1958	18,585	14,995	81
1959	18,000	14,454	80
1960	17,876	11,331	63
1961	18,000	14,409	80
1962	18,000	9,372	52
1963	18,000	9,581	53
1964	16,000	11,700	73
1965	14,499	7,294	50
1966	15,000	10,890	73
1967	14,970	10,251	68
1968	7,499	5,445	73
1969	7,500	5,282	70
1970	6,656	4,721	71
1971	10,000	7,381	74
1972	10,000	6,674	67
1973	10,000	6,428	64

Numbers of pheasants harvested peaked in 1963-64 and have decreased, except in 1969, ever since. Regional and county pheasant harvests are presented in Chapter 4.

That a majority of Montana's pheasant hunters spend little time afield after the opening day or weekend is supported by harvest questionnaire results. Approximately 57 percent of the hunters annually harvested an average of 3 (1 daily limit) or less pheasants during 1967-73 (Table 11). Only one-eighth of the hunters bagged more than 9 pheasants (3 or more daily limits per season). The average seasonal bag of successful hunters (i.e. hunters who bagged at least 1 pheasant during the season) was 3.6 pheasants.

The top 10 pheasant harvesting counties in Montana, 1967-73 (Table 12) were determined by comparing county harvests with county acreages. Cascade County has been the top pheasant-yielder, rating first or second in six of the seven years. It contains the second largest city (Great Falls) in Montana.

Table 10. **Number of upland game bird hunters and number of pheasants harvested in Montana, 1948-73.**

Year	No. Persons Licensed to Hunt Pheasants	No. Pheasants Harvested	Percent Pheasants[A]	Average No. Pheasants Harvested Per Hunter
1948	- -	198,000	- -	- -
1950	- -	211,300	- -	- -
1952	- -	257,800	- -	- -
1953	64,107	171,806	- -	2.7
1954	- -	392,630	- -	- -
1958	77,147	231,013	33	3.0
1959	70,472	174,882	40	2.5
1960	71,860	157,192	45	2.2
1961	59,213	169,351	39	2.9
1962	74,798	190,331	39	2.5
1963	86,262	309,807	43	3.6
1964	86,646	358,015	40	4.1
1965	86,116	107,190	30	1.2
1966	83,753	221,130	32	2.6
1967	46,712	97,109	22	2.1
1968	48,548	95,196	25	2.0
1969	50,842	114,528	26	2.3
1970	41,478	96,303	27	2.3
1971	34,348	90,643	27	2.6
1972	39,500	68,138	20	1.7
1973	46,239	66,314	16	1.4
Averages	62,826	179,937	32	2.7

[A]Percent of all upland game birds harvested.

Table 11. **Proportions of Montana hunters bagging various numbers of pheasants per season, 1967-73.**

Year	Pheasants Bagged Per Season by Successful Hunters						Average Seasonal Bag of Successful Hunters
	1	2	3	4-6	7-9	9+	
	Percent of Hunters						
1967	20	19	15	25	8	13	3.4
1968	21	19	24	18	9	9	3.1
1969	17	20	16	26	7	14	3.9
1970	22	15	17	23	7	16	3.8
1971	20	15	22	20	10	13	4.5
1972	20	20	18	24	8	10	3.3
1973	20	23	14	22	7	14	3.2
Averages	20	19	18	23	8	13	3.6

A good hunting dog flushes many pheasants that will remain hidden until the lone hunter passes by. *—(Photo by R.J. Fischer)*

Table 12. **Top ten pheasant-harvesting counties in Montana, 1967-73.**

Rank	1967	1968	1969	1970	1971	1972	1973
1	Cascade	Cascade	Pondera	Pondera	Cascade	Lake	Sheridan
2	Pondera	Pondera	Cascade	Cascade	Lake	Cascade	Lake
3	Teton	Yellowstone	Lake	Lake	Fergus	Fergus	Richland
4	Fergus	Teton	Treasure	Teton	Pondera	Teton	Fergus
5	Treasure	Lake	Teton	Treasure	Teton	Richland	Cascade
6	Lake	Fergus	Fergus	Fergus	Yellowstone	Pondera	Judith Basin
7	Judith Basin	Sheridan	Yellowstone	Yellowstone	Judith Basin	Judith Basin	Dawson
8	Yellowstone	Treasure	Carbon	Judith Basin	Chouteau	Sheridan	Petroleum
9	Sheridan	Flathead	Chouteau	Chouteau	Richland	Yellowstone	Deer Lodge
10	Broadwater	Bighorn	Judith Basin	Richland	Flathead	Treasure	Teton

HABITAT DEVELOPMENT

Montana's major pheasant range coincides with irrgation projects and major waterways. Land within these areas is quite expensive, privately owned and often unavailable for purchase by the Department of Fish and Game. Big game ranges, on the other hand, frequently lie on public land, or on private rangeland. In the latter case, land costs are not as high as in farmed areas and many winter big game ranges have been purchased by the Department.

On Public Land

Ownership of land in Montana in 1970[121] was: 65 percent by private individuals (including corporations); 30 percent by the federal government (administered by the U.S. Forest Service, U.S. Bureau of Land Management and etc.); and 5 percent by state agencies (mostly state school lands). Little pheasant habitat or habitat potential exists on national forests or grazing lands. Some state school lands have considerable potential for pheasant habitat; until just recently, little or no consideration was given to pheasants or other wildlife on these public lands. Representatives of the State Land Department indicate they will try to cooperate more in maintaining, and even develop, wildlife habitat on these lands in the future.

Reimbursing private landowners by the Montana Department of Fish and Game for developing or maintaining wildlife habitat to date has not been feasible. Limitations on Department funding demands the greatest game harvest-return per hunter-dollar expended. This demand is met more economically through habitat development and maintenance on Department-owned or leased land where every acre can be devoted to producing wildlife.

Pheasant habitat managed on Freezout Waterfowl Management Area (Teton County) by the Montana Department of Fish and Game. *—(Photo by J.P. Weigand)*

The Montana Department of Fish and Game presently administers 14 Game Bird Management Areas (Fig. 5) which contain pheasant habitat. These areas total 40,720 acres and are located throughout the state. Many, however, contain large water bodies and are managed primarily for use by waterfowl. Freezout Management Area (Teton County) is the largest such unit with 11,349 acres. Approximately half of this unit is covered with water. Croplands utilized by waterfowl have been bordered with shrub belts to provide winter cover for pheasants.

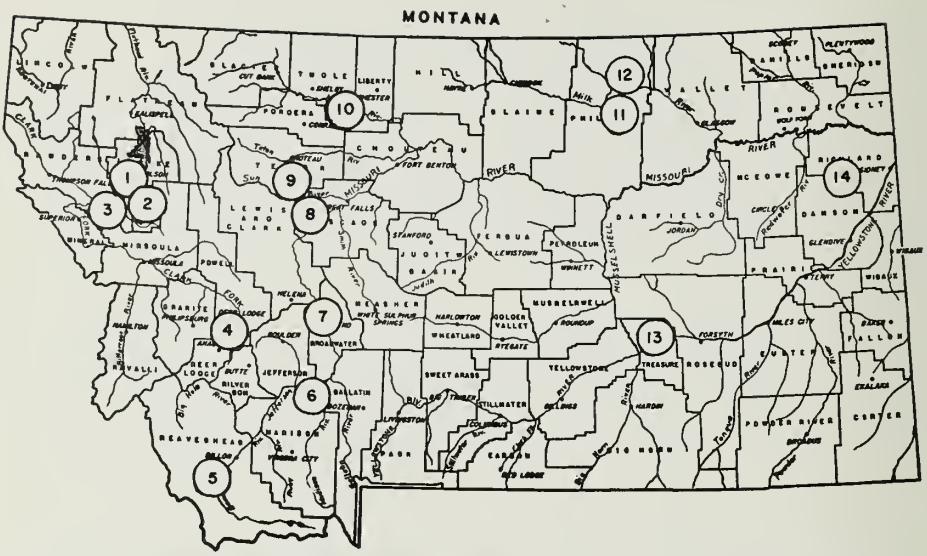


Figure 5. **Game bird management areas[1] administered by the Montana Department of Fish and Game, 1970.**

Map No.	Name	County	Acres
1	Pablo	Lake	388
2	Ninepipe[1]	Lake	2,755
3	Moiese Game Farm	Lake	80
4	Warm Springs[2]	Deer Lodge	3,135
5	Clark Canyon[3]	Beaverhead	1,200
6	Missouri Headwaters	Gallatin	1,486
7	Canyon Ferry[3]	Broadwater	4,970
8	Muddy Creek	Cascade	680
9	Freezout[2]	Teton	11,349
10	Tiber Reservoir[3]	Toole & Liberty	10,420
11	Bowdoin	Phillips	156
12	Milk River	Phillips	2,046
13	Pease Bottom	Treasure	693
14	Fox Lake[2]	Richland	1,362

[1] Owned and leased by the Montana Department of Fish and Game.

[2] Part of these areas are covered with water.

[3] Managed under U.S. Bureau of Reclamation agreement.

Three areas (Canyon Ferry, Clark Canyon, and Tiber Reservoir) are managed by the Department of Fish and Game under cooperative agreement with the U.S. Bureau of Reclamation. Pheasant habitat management plans are currently being outlined for the first two areas. The Tiber area contains 10,420 acres but most of this acreage is included in the reservoir; the remainder of the area is only marginal pheasant habitat.

When managed for pheasants these areas perform a number of valuable functions for Montanans. By serving as demonstration areas, farmers and hunters can view first-hand the results of good pheasant-habitat management. In contrast to preserves, the areas are open to public hunting and permission to hunt is not required, a feature which many hunters welcome. Such areas can absorb considerably more hunting pressure than adjacent private lands when pheasants, not agricultural crops, are the primary crop. They may also alleviate hunting pressure on nearby private land.

The present acreage managed by the Department of Fish and Game for pheasants amounts to less than 1/2-acre per upland bird hunter. Good pheasant habitat will yield about one pheasant per 5 acres in the fall. Harvest data since 1948 indicated an average 180,000 pheasants were bagged each year. To provide for this harvest level in the future approximately 900,000 acres of pheasant habitat would have to be maintained. At the present time less than 20,000 acres of Department administered lands contain actual or potential pheasant habitat. More of these areas, particularly near larger human population centers, will be needed if future hunting demands are to be met.

Since most Montana hunters have been more concerned about big game than small game, the Department of Fish and Game has emphasized big game winter range in its acquisition program. Unless hunters express more concern for pheasant habitat in the future, the public land available for maintaining pheasants will remain very limited.

On Private Land

Habitat development for wildlife, and specifically for pheasants, on Montana's privately owned lands has had a varied history. Prior to financial assistance through federal agricultural programs, habitat development depended on concern of individual landowners for wildlife. Since the economics of farming and ranching is of primary concern to the rural landowner, this development was done largely by accident rather than by intent.

Federal Programs

The advent of federal programs, which encouraged retiring private agricultural land from crop production and livestock grazing, was a major step forward in planning habitat for wildlife. The potential benefits of all these programs were not fully realized in Montana or elsewhere for various reasons. Farming economics, the degree of enthusiasm and participation by landowners, program funding limitations imposed by the President and/or Congress, and the ability or desire of the responsible federal agencies to administer and enforce provisions of each program—all were in part responsible for success or failure of individual programs.

Most publicly-funded private land management practices since 1938 have been based on the Soil Conservation and Domestic Allotment Act of 1936. It provided for establishment of the Agricultural Stabilization and Conservation Service (ASCS); this agency administers moneys allocated by Congress each year for farmland management. The U.S. Soil Conservation Service (SCS) provides the technical assistance in planning and engineering these programs.

Seeding Vegetative Cover on Farmland

The drought and general economic depression of the 1930's apparently led to the seeding of over 674,000 acres farmland to "permanent" vegetative cover in Montana by 1940 (Fig. 6). This land "retirement" peak coincided with the buildup of peak pheasant populations in Montana. United States' involvement in World War II resulted in increased crop and beef production and acres seeded under this practice were returned to agriculture production. Vegetation seeded under this practice obviously was not "permanent". Despite only fair interest by landowners, 1957-72, approximately $8.9 million was paid to Montana landowners who included it in their farm management programs.

Soil Bank Program

The Conservation Reserve of the Soil Bank Act of 1956 offered up to 10-year land retirement contracts to landowners. It provided reimbursement for retiring land from crop production with subsequent establishment of "permanent" vegetation. At its zenith in 1960, 2,053 farms in 51 counties had 629,919 acres enrolled in this program (Fig. 6) in Montana.

The effect of Soil Bank acreages throughout the Midwest and West was a very noticeable increase in pheasant populations during the late 1950's and early 1960's. A Michigan study[122] indicated there were twice as many crowing cocks in the spring, 2½ times as many broods in the summer and better hunting success on Soil Bank than non-Soil Bank farms. Roadside pheasant counts during 1956-58 showed increases of 39 percent in Iowa, 52 percent in Minnesota, 77 percent in Nebraska, 17 percent in North Dakota and 96 percent in South Dakota.[123]

It was concluded that above-average nesting success between 1956 and 1958, a result of increased *undisturbed* nesting cover, was responsible for the population increases.

Pheasant numbers in Montana also increased during 1957-59. To many current Montana pheasant hunters these were "the good old days."

The last retired-acres under Soil Bank in Montana returned to crop and forage production in 1969. During its 14-year history, $45.9 million were spent in Soil Bank land retirement-wildlife habitat development in Montana.

Feed Grain Program

U.S. Public Law 87-5 provided for the 1961 Emergency Feed Grain Program (FGP); this program was extended through 1972. Its primary objectives were to reduce the buildup and surpluses of feed grain supplies through annual land retirement contracts. Each unit of land, during its year of retirement from crop produc-

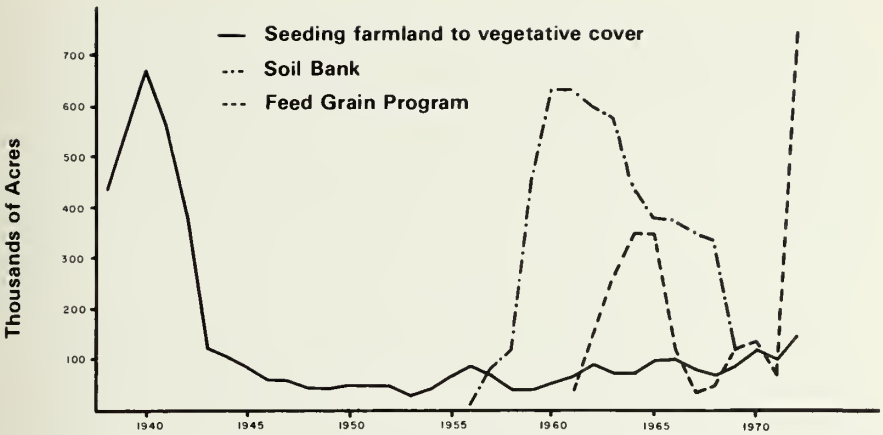


Figure 6. **Acreages retired from cropland production in Montana, 1938-72, under payments from the U.S. Department of Agriculture.**

tion, was seeded to annual vegetative cover; oats was a favored crop for this seeding throughout the program. Retired lands were popularly referred to as "Set Aside" or "Diverted" acres.

FGP benefits to pheasants and other farmland game seemed obvious since even annual vegetation would provide much needed cover. Landowner enthusiam was high and considerable acreages were enrolled in FGP. In Montana, 1961-71, FGP farms numbered 1,654 to 10,705 annually, farms in all 56 counties were represented during at least five years and annual crop diversions ranged from 39,941 to 344,379 acres (Fig. 6).

Early FGP evaluations confirmed the seeded vegetation cover was used by nesting pheasants.[124] [125] However, it was simultaneously discovered that oats, seeded as cover crops, were planted after regular cash crops were seeded; pheasant nesting was already underway before the oats contributed much nesting cover. Oats were seeded at rates less than oats seeded as cash crops; cover value to pheasants was low and predation on nests was high. FGP acreages were mowed, clipped or sprayed with herbicides prior to the peak of pheasant hatching and many fields were fallowed the same year as seeded.

Investigations in 1972 in 13 midwestern and western states (these states contained about 55 percent of U.S. cropland and its retired feed grain acreage) showed 57 percent of FGP acres had no cover crop; most were summer fallowed.[126] Half of the remaining acreage was in new seedings and half had cover crops established the previous year. Less than one-fourth of FGP acreages contained vegetative cover and then only for 2 or 3 months each year.

Between 1961 and 1972 in Montana, 569,283 acres of corn and 1,823,089 acres of barley were enrolled in FGP at a total cost of $39.4 million to taxpayers. These acres could have provided much needed pheasant cover but apparently failed to do so. Surveys showed pheasant populations continued to decline through 1972. Based on the experience of neighboring states, it is highly probable that the FGP in Montana offset any habitat pheasants gained under the Soil Bank.

Cropland Adjustment Program

The Food and Agricultural Act of 1965 included the Cropland Adjustment Program (CAP). Major purposes of CAP were to encourage public use of retired private land and to reduce costs of the annual acreage diversion programs. CAP offered landowners 5- to 10-year contracts for land retirement, cost-sharing for establishing wildlife food and cover areas, and specific monetary incentives to farmers for permitting public access (for hunting, fishing, hiking and trapping). This program featured the first government subsidy to farmers for allowing public recreation on private land.

That pheasants, hunters and landowners benefited from CAP was established in at least two states. In Indiana, hunters saw more pheasants per hour (0.65 vs. 0.36), harvested more pheasants per hunter (0.36 vs. 0.25) and took less time to bag each pheasant (6.9 vs. 10.0 hours) on CAP than on non-CAP lands[127]. In Nebraska, 111,000 CAP acres were opened to public recreation and a calculated 58,400 resident hunters hunted CAP land in 1970[128]. Hunting success in Nebraska paralleled that in Indiana. In addition, more than 85 percent of the hunters who hunted Nebraska CAP lands favored continuance of the program. And over 95 percent of the CAP farmers responding to questionnaires, would sign up under CAP if it were offered again.

Peak numbers of CAP contracts in Montana occurred in 1967 with 189 farmers (in 33 counties) enrolling 34,811 acres. Only 32 farmers (17 percent) included public access for recreational purposes; only 8,769 acres were made available to Montana pheasant hunters!

Wildlife Conservation Practices

During the mid-1950's, federal cost-sharing was available to private landowners for a series of wildlife habitat development and improvement practices. Establishing permanent vegetative cover, food plots, shrub and tree belts and fencing these areas for wildlife qualified for payments. The landowner could be reimbursed up to 80 percent of the expense for materials and labor under this program. Such practices offered tremendous benefits for pheasants.

Enthusiasm by Montana's private landowners for this program was something less than encouraging. Participation in these projects was virtually non-existent until 1963. Between 1963 and 1972, less than 200 landowners developed less than 11,000 acres of wildlife habitat under these practices. Total cost of this program during the 10-year period was less than $50,000. *Average annual ASCS payments (taxpayer money) for noxious weed control, 1957-71, were more than the total amount expended for wildlife habitat development!* More acres of Montana wildlife habitat have experienced either mechanical or chemical weed control, at taxpayer expense, through the ASCS in any given year since at least 1948 than the total acres developed for wildlife habitat, 1963-1972!

A considerable number of shrub and tree belts have been established by private landowners through ASCS subsidization in Montana. The primary intent of these developments was shelter for livestock and farm or ranch houses from adverse weather conditions. Many of these developments also provided shelter for wildlife but wildlife values were considered almost as an afterthought.

Wetland Programs

The value of wetlands to pheasants has been expressed many times across the mid-western U.S. A recent Wisconsin study[129] reported pheasants used wetlands all year 'round; they provided roosting and nesting cover in the spring, brood and roosting cover in the summer, roosting areas in the fall, and protective cover in the winter. During 1956-72, over 4,200 Montana landowners drained, or facilitated drainage, of approximately 191,900 acres of wetlands with $1.6 million in assistance from the ASCS. During 1943-55, 5,245 landowners had already drained indeterminable acreages of wetlands with these federal monies. No record of wetland acreages drained through personal financing of landowners is available.

While all of the Montana wetland acreage drained was not necessarily critical to pheasants, certainly removal of some (if not most) wetlands contributed to reduced pheasant habitat. Draining wetlands through the engineering efforts of the SCS and funding by ASCS Programs included specific guidelines for avoiding drainage of areas valuable to waterfowl. Wetland values to upland game, however, were not recognized in these guidelines. Since the guidelines were frequently overlooked and drainage proceeded anyway,[130] it is doubtful additional provisions for protecting pheasant habitat would have been considered.

Consultation

The game biologist's role as a professional consultant in pheasant habitat planning has not been fully utilized in Montana. Biologists are qualified to diagnose factors limiting pheasant populations in an area and to recommend remedial measures.

State and federal land management agencies may consult department biologists when land uses and management practices involve establishing new or altering existing pheasant habitat. Passage of Montana's Environmental Quality Act in 1971 requires that environmental impact statements be prepared by any government agency proposing alterations of the environment. When proposed alterations are detrimental to pheasants it is the biologist's responsibility to recommend against those alterations. These recommendations are particularly important if sportsmen tax-monies are to support habitat destroying practices. Alternative, less-destructive approaches to such proposals may be suggested.

Private land managers may also request biologists' assistance. Inspection of a farm may reveal that a food source or necessary cover is absent. The biologist may recommend development of these areas, which may be eligible for federal financial assistance. If the landowner feels he cannot afford this additional financial or labor burden, it would be worthwhile for the local rod and gun club to lend a hand. Cooperative hunter-landowner efforts along this line will aid in cementing better relations as well as providing a positive approach to increasing pheasant numbers.

The landowner may feel economical management on his farm will not permit special development of pheasant habitat. In some cases he could improve or maintain existing cover by not burning roadsides, fencerows or idle corners. He could keep livestock away from shelterbelts, marshy areas, creek banks and irrigation ditches. Access to water in these latter areas could be provided at pre-

Nesting cover along Montana's railroad rights-of-way before (upper) and after (lower) burning. *—(Photos by J.P. Weigand)*

determined areas. Pesticide-use must be limited to those occasions when it is absolutely necessary. Even some agricultural advisors now admit that a few insect and plant pests on farmland are economically tolerable.

The main limiting factor on Montana's pheasant populations is habitat. That most land use planning has proceeded without biologist consultation is readily evidenced by continued habitat deterioration and declining pheasant numbers!

PREDATOR CONTROL

The relationships of predators to pheasant populations were presented earlier in this bulletin. Pheasants may experience a reduction in numbers by predators but only to the security threshold of their habitat.

Bounties, payments by state or county governments for killing predators, do not control predators because sportsmen pursue predators like game animals. That is, they will hunt predators until the unit of effort expended in killing one animal becomes too great to keep them interested. Hunted predators become just as evasive as prey species and hunters are unable to harvest them down to base breeding stock

levels. True sportsmen recognize the sporting potential of hunting predatory animals and do not need this "blood money" incentive to get them afield.

All species of eagles, hawks, owls and gulls are currently protected by federal or state law in Montana. Natural laws governing each species will hold their numbers to the limits of their environment. Problems concerning excessive predation on pheasants by individual raptors may occasionally arise and should be treated as provided by law. It is not necessary to condemn an entire species for the undesirable feeding habits of a few individuals.

Recent predator-pheasant studies in South Dakota[131] showed pheasant populations can be increased significantly if *all* important mammalian predators, not just one species, are intensively controlled. However, the cost of $41 per square mile (during 1967-71) would require expenditure of more than one-half million dollars annually if applied to Montana's pheasant range. That amounts to more than $10 per upland game bird hunter; the 1973 upland game bird stamp was only $2! Environmental objections would certainly be encountered to such a far-reaching program.

Perhaps Dr. I.O. Buss, after visiting western Montana in 1948, summed up predator control best. "Forget about predator control. If you furnish the proper range conditions wildlife, especially pheasants, will be very able to maintain themselves in good numbers. Practically any management measure that helps the carrying capacity of the land will pay bigger dividends than wasting money trying to reduce predators."[132]

REFUGES

The refuge concept of protecting game birds dates back to 1536 A.D. when King Henry VIII closed certain areas to heron, partridge and pheasant hunting.[133] This "cure-all" was attempted in the United States to check declining waterfowl populations. By 1911, the idea reached Montana and preserves were set aside for big game and game birds in Dawson and Gallatin Counties, and in the Pryor Mountains. Many more preserves were subsequently established.

Early principles of the preserve system included absolute prohibition of hunting and shooting on the area involved. When later applied to upland game birds, the basic idea was to provide protection for a segment of the population. This nucleus would reproduce each year and the surplus birds would supposedly overflow onto adjacent lands. On paper it looked good; in the field quite another story unfolded.

A number of land tracts were leased by the Montana Fish and Game Department from private landowners in the 1940's to serve as pheasant refuges. Six tracts were leased in Gallatin County in 1945 and four tracts, 1 or 2 acres in size, were leased in the Flathead Valley in 1947. These and other similar parcels of land were fenced to prevent use by livestock; food shelters and piles of grit were provided within each enclosure. Local sportsmen maintained food levels in the hoppers for pheasants. During mild winters little or no use by pheasants was noted in these areas; even during normal or severe winters some areas showed little pheasant sign.

The Montana Fish and Game Commission established 6 refuges, totaling 160 acres, on the Fairfield Bench (Teton County) in the mid-1940's. A total of 1,231

game farm pheasants was released during 1947 and 1948 on or near these refuges; nonetheless, the birds left the refuges and 282 (23 percent) were reported as harvested by hunters. It was apparent that habitat in the refuges contained wild pheasants and the pheasant population could not be increased further.

During July, 1948, 16 sites near Culbertson (Roosevelt County) were inspected for possible refuge establishment. One area was a natural refuge, and the remainder required some development of cover or food patches. Since hunting pressure was light in the area and winter cover was lacking on most areas the need for refuges was judged to be non-existent.

The effects of refuges on pheasant numbers in states with much more hunting pressure than that in Montana were also investigated. Pheasant "sanctuaries" were established in Michigan at the request of many landowners.[134] Once active, even the landowners were disappointed to find that after a few years these inviolate areas held no more birds than adjacent hunted areas. A Wisconsin pheasant study[6] showed the annual turnover rate was 70 percent on hunted areas and 81 percent on a refuge. In spite of protection from hunters, the refuge population was reduced by natural factors. These studies lead to the conclusion that hunting by humans removes a portion of the pheasant population which would have died anyway.

When dealing with preserves one must define that segment of the population to be protected. In counties or states where cocks-only regulations are in effect, the entire area becomes a hen refuge. Total protection of hens in Montana in the past has not resulted in myriads of pheasants today.

If preserves are established to protect pheasant cocks, pheasant biology must be considered. A cock is capable of mating with 50 hens, at least in captivity, while in the wild it is known that 1 cock per 10 hens is sufficient to achieve maximum egg fertility. About 90 percent of the cocks hatched each year are not needed for successful reproduction, and most of these could be taken by hunters without affecting populations of following years.

In Montana, following cocks-only hunting seasons, winter sex ratios have averaged between 25 and 50 cocks per 100 hens. Proportions of cocks have dropped below 20:100 only on a few heavily hunted areas. Hunting pressure in Montana has not been great enough to justify game preserves to protect cock pheasants.

A detrimental aspect of game preserves is that they may concentrate pheasants in poor habitat during the hunting season. This could lead to increased losses by predation and other causes during the following winter. The net result would be no more pheasants than in an unprotected area with poor habitat.

There are 19 State Game Preserves in Montana at the present time. Most are on privately-owned property and many contain some pheasant hunting potential. Two of these, the Flathead Lake Preserve (about 40 acres) and Teton-Spring Creek Preserve (6,400 acres) were established by legislative action. The annual pheasant surplus feeds local predators due to preserve status of their habitat. Abolition of these two preserves would require legislative attention.

The other 17 areas, constituting over 49,000 acres, have been designated as bird preserves by previous Fish and Game Commissions. The largest such area is in Liberty County (Brinkman Preserve, 12,800 acres). The second largest area lies southeast of Manhattan (Gallatin County) and includes 5,100 acres. Both of these areas include pheasant habitat and hunting potential. Another 5,100 acre preserve

lies in and adjacent to Great Falls; much of this area has been incorporated into the city's expansion program and no longer fits the bird preserve designation. These areas could be withdrawn from refuge status by Fish and Game Commission action.

In summing up the matter of preserves we should ask, "Are pheasant preserves in Montana justified?" The evidence indicates that they are not. A thorough review of all the state's bird preserves is in order. Removal of these areas from the non-hunting status could open additional acreage to public hunting.

STOCKING

Pheasants were introduced into Montana because they substituted the desirable sporting qualities of native upland game birds which were on the decline (see History). Until 1930, ringnecks released in various locations were purchased from out-of-state stocks or wild birds were trapped and transplanted within the state.

The first Montana Fish and Game Department game farm was constructed at Warm Springs in 1929 (Montana's first pheasant hunting season was in 1928). A second game farm was built in Billings in 1935; it was closed in 1959. The third game farm was in operation during 1940 to 1962 at Fort Peck. An epidemic of botulism killed all 10,000 pheasants raised in 1960 at Fort Peck.[135] Since the soil in the pens was contaminated with botulism-producing organisms, pheasant rearing operations were terminated here. The only current operational game farm in Montana is at Warm Springs.

Purposes

Stocking pheasants may serve one of three purposes:

(1) introducing them into habitats where they previously did not exist;
(2) repopulating an area with pheasants where the previous population has been eliminated or seriously depleted through natural catastrophe;
(3) releasing pheasants into an area where the hunter pays for each bird he shoots (e.g. commercial shooting preserve).

Pheasants were successfully established in many areas of Montana, and in some areas they failed. With establishment, however, the first function of stocking was fulfilled. Natural catastrophes (blizzards, hailstorms, flooding) have depleted pheasant numbers in some areas but over the years natural replenishment has occurred. Therefore the need for full-time game farm operations to provide pheasants for the second reason cannot be justified. In the past, supplies of wild pheasants have been adequate so commercial pheasant-shooting preserves have not been very successful. Apparently the Montana Fish and Game Department has been relegated to providing a few hunters with game farm birds on a put-and-take basis at considerable expense.

Procedures and Results

Normal Department game-farm operations include retention of some older and some younger birds as breeding stock for the next year. A majority of the annually-

produced chicks and some old breeders are released each year. In August, 1947, 615 8-week old chicks were released near Moiese (Lake County); at least 119 birds (19 percent) died before the hunting season opened October 26. Approximately 1,000 8- to 12-week old birds were released in August, 1950 in the Bitterroot Valley; 81 (8 percent) were receovered dead within the following month and 90 (9 percent) were recovered before the November hunting season. A noticeable proportion of the stocked birds did not survive long enough to provide recreational hunting the first fall after release. It was also concluded that the older week-class chicks survived better after release than the younger week-classes.

Release of game-farm stock as a technique to increase pheasants in Montana is as outdated as this 1936 truck. *—(Montana Dept. of Fish & Game Photo)*

In 1953, four different age classes were released (each age group released on a different date) in the Bitterroot Valley. Hunters harvested more of the latest released group than the earlier released groups (Table 13). Studies in other states,[119]

Table 13. **Numbers, ages and dates of game farm pheasant cocks released and harvested in the Bitterroot Valley, 1953.**

Date of Release	Age (in weeks) of Birds Released	No. Released	Birds No.	Harvested Percent
August 1	9	100	24	24
September 5	11	99	18	18
September 28	14	100	13	13
November 7[A]	Unknown	99	56	57
		Totals 398	111	28

[A] Hunting season opened November 8.

[136] verified that later-released pheasants are harvested at a greater rate than earlier-released birds. The greatest hunter returns result from birds released opening day or during the hunting season.

Game farm pheasant contributions to the harvest were evaluated in the Gallatin Valley (Gallatin County) in 1947-48.[137]. Banded game farm-reared cocks and hens were stocked at four sites during late summer each year. Thirteen percent of 86 cocks released in 1948 and 15 percent of 289 cocks released in 1949 were shot by hunters. The average (14 percent) return of bands from game farm pheasants in 1948-49 correspond to returns from various regions in Montana (Chapter 4) during later years.

One reason (in addition to time of release-time of hunting season mortality) why greater percentages of game farm-reared pheasants are not harvested by hunters is that many birds move away from release sites. The Gallatin Valley study showed 42 percent moved less than 1 mile from release points while 50 percent moved 1 to 3 miles, 2 percent moved 4 to 5 miles and 6 percent moved 9 to 14 miles.[137] These findings were supported by the harvesting of 14 percent of 1947 and 28 percent of 1948-game farm pheasant cocks released on 6 refuges on Fairfield Bench (Teton County). At each of these sites either all available habitat was already occupied by wild pheasants or the game farm birds could not cope with natural, wild conditions and went looking for "home".

Contributions of game farm pheasants (surviving their first hunting season) to the following years' production is remote. In California, 95 to 99 percent of the game farm pheasants died during their first year after release;[138] this was considerably poorer than the 73 percent annual mortality of wild pheasants in the same area. Bands returned from game farm pheasants released in Montana also show poor survival. In northcentral Montana, 94 percent of 8,073 returned-bands (from released game farm birds), were recovered during the first hunting season (Table 14). In southwest Montana, 97 percent of 2,990 returned-bands were recovered during the first hunting season (Table 15).

Game farm pheasants have not added significantly to the overall annual pheasant harvest in Montana. In 1948 less than 3 percent of the pheasants examined at check stations on Fairfield Bench were game farm birds. In 1949 only 5 percent of the Fairfield Bench birds examined were game farm birds. Higher proportions of game farm birds have occurred in opening day harvests in recent years in the Bitterroot Valley and Fairfield Bench. However, habitat in these areas is of such low pheasant value that wild pheasant populations are very low. Life expectancy of wild or game farm birds would expectedly be very low.

Releasing game farm pheasants in the spring to bolster sagging wild breeding stock has also been attempted in Montana. Sixty-two hens were released in the Jefferson River Valley (southwest of Whitehall, Madison County) during the spring of 1948. Observations that summer indicated the birds left the area. During March, 1949, 50 cocks and 88 hens (10 to 11-months old) were released in the Bitterroot Valley. These birds, some with green- and some with red-dyed tail feathers, were observed up to 7 miles from release sites. Twenty-two birds (15 percent) were found dead, no nests were found during intensive field searches, and only 3 tail-dyed hens were seen with broods that summer.

Table 14. **Summary of game farm pheasant cocks released and bands returned in northcentral Montana, 1963-70.**

Pheasants Planted		Bands Returned By Hunters																			
		1963		1964		1965		1966		1967		1968		1969		1970		1971		Totals	
Year	No.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1963	1,230	97	7.8	35	2.8	2	0.2	0	- -											134	10.9
1964	937			126	13.4	3	0.3	0	- -											129	13.8
1965	1,839					226	12.3	20	1.1	1	T	0	- -							247	13.4
1966	1,087							45	4.1	1	0.1	0	- -							46	4.2
1967	630									164	26.0	0	- -	0	- -					164	26.0
1968	850											113	13.3	0	- -	3	0.4	0	- -	116	13.6
1969	700[A]													111	15.9	3	0.4	0	- -	114	16.3
1970	800															164	20.5	0	- -	164	20.4
Totals	8,073																			1,114	13.8

Year Returned	No.	% of Total Returned (1,114)
Year of release	1,046	93.9
1st year after release	62	5.6
2nd year after release	6	0.5
3rd year after release	0	- -

[A] Included some banded hens.

Table 15. **Summary of game farm pheasant cocks released and bands returned in southwest Montana, 1961-1967.**

Pheasants Planted		Bands Returned By Hunters																	
		1961		1962		1963		1964		1965		1966		1967		1968		Totals	
Year	No.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1961	150	13	8.7	2	1.3	0	--											15	10.0
1962	250			117	46.8	0	--	2	0.8									119	47.6
1963	360					108	30.0	6	1.7	0	--	2	0.6	2	0.6			118	32.8
1964	200							52	26.0	1	0.5	0	--	1	0.5			54	27.0
1965	1,050									180	17.1	1	0.1	0	--			181	17.2
1966	400											38	9.5	2	0.5			40	10.0
1967	580													87	15.0	0	--	87	15.0
Totals	2,990																	614	20.5

Year Returned	No.	% of Total Returned (614)
Year of release	595	96.9
1st year after release	12	2.0
2nd year after release	2	0.3
3rd year after release	3	0.3
4th year after release	2	0.3

In Wisconsin, spring-released game farm hens produced smaller broods than wild hens.[139] This study also suggested that about 2/3 of the hens either did not survive until summer or left the release area. Hens that survived and successfully hatched a clutch of eggs provided an average of less than 1 cock to the fall population.

Occasionally pheasant stocking is requested to provide a source of "new blood" for an "old, worn-out" pheasant population. In 1937, two cock and six hen pheasants were released on Protection Island off the coast of Washington.[140] Distance from the mainland prohibited pheasants from leaving or coming to the island. In 1941 a cenusus showed there were approximately 1,540 pheasants. Egg fertility was about 90 percent. Hawks and owls were estimated to be taking less than 10 percent of the pheasants each year. If inbreeding were a serious problem in pheasants it should have been demonstrated in this isolated population. It did not come about.

There is growing concern, among Department biologists, that continued stocking of game farm pheasants may have had adverse effects on existing wild populations. Evidence supporting this hypothesis is that areas into which game farm birds have been stocked almost continuously, and where wild populations once flourished, are now almost devoid of pheasants. These declines have occurred in areas which have what appears to be good pheasant habitat. It is possible that game farm birds have displaced wild birds from their niches but the survival of game farm birds is too low for them to take advantage of the vacated areas. It also seems plausible that with continued stocking over a long period of time, the advantageous traits of wild pheasants have been genetically diluted by stocked birds to the point that wild birds cannot survive as long as their predecessors.

Costs vs. Benefits

Cost-benefit ratios should also be considered in evaluating Montana's pheasant stocking program. Inflation has driven up the very early cost of $1.00 for producing each bird to approximately $3.00 per bird in 1973. In 1973 if it cost $300 to produce 100 pheasants (50 cocks and 50 hens), cocks-only hunting regulations were in effect and there was an average 15 percent harvest of the released cocks, the cost for each of the 8 cocks bagged would have been $40! Furthermore, if each cock weighed 2½ pounds, game farm pheasants on the dinner table cost $16 per pound, excluding all costs incurred by the hunter in pursuing the bird.

Consider, too, that the 1973 Montana upland game bird hunting stamp cost $2. Providing one game farm cock in one hunter's bag requires the expenditure of the hunting stamp-money from 20 bird hunters! A South Dakota pheasant biologist effectively summed up pheasant stocking economics:[141] "Stocking pheasants borders on economic insanity." And South Dakota, with their historically tremendous pheasant populations, has never had a state-owned pheasant farm!

Releasing pen-reared or wild-trapped pheasants into new areas is a proven method of expanding pheasant distribution. Since 1930 over 830,000 game farm-reared ringnecks (Appendix III) have been released in Montana; they have been introduced and reintroduced into every potential pheasant habitat in the state. Evaluations of our stocking program shows it has served its purpose (establishing pheasants in Montana) and should be abandoned.

Sportsmen-money spent for stocking would benefit pheasants and pheasant-lovers more if it was spent on land acquisition and habitat improvement programs. These programs represent long term investments for Montana's pheasant populations and hunters; and they will pay higher dividends.

EARLY RELEASES — MOST OF RANGE EMPTY.

1930's — PRACTICALLY ALL RANGE OCCUPIED.

TODAY – CONTINUED STOCKING WASTEFUL. FOR MORE PHEASANTS WE MUST MAKE A BIGGER TUB – BY IMPROVING THE HABITAT.

RESEARCH

The function of pheasant research is to provide the knowledge and tools needed to effectively and scientifically manage pheasants. Investigations which probe pheasant life history, pheasant-habitat and cause-and-effect relationships (e.g. the effects of a given insecticide on pheasant populations) are categorized as basic research. Studies which reveal broad population and habitat changes are the realm of applied research. Both types of research are employed in Montana.

Since research studies involve spending public moneys (from hunting licenses and excise taxes on hunting equipment), the Montana Department of Fish and Game has directed pheasant research toward its application to Montana's problems and conditions. This avoids duplication of efforts and unnecessary expense for the same pheasant research conducted in other states.

In view of the rapid, recent and extensive changes in land uses and management practices in Montana, the need for pheasant research continues. To cease pheasant research at this time could well result in further reduction of pheasant populations and expensive, non-productive controversies on "why" pheasants are declining.

A successful trophy pheasant hunt—a limit of cocks taken with a black powder, muzzle-loading shotgun. *—(Photo by J.P. Weigand)*

SUMMARY

Pheasant management is the art of making the land produce a sustained annual yield of pheasants for sport hunting and other recreational pursuits. It consists mainly of identifying factors limiting pheasant numbers and controlling them.

Since the Montana Department of Fish and Game manages less than 0.5 of the state's total land area, a major portion of the pheasant supply is provided by other (mostly private) land managers. The Department fulfills its pheasant management obligations through seasonal population surveys, by regulating pheasant harvests through sport hunting, and by publicly identifying factors limiting pheasant populations.

Pheasant populations in Montana peaked in the late 1930's and early 1940's, crashed in the mid 1940's, staged a partial comeback during the late 1950's and early 1960's, and has been declining ever since. Attempts to bolster sagging pheasant populations through restrictive hunting regulations (including closed seasons), establishment of refuges, stocking game farm-reared pheasants, and predator control have failed. Land use and management practices have been identified as the factors limiting pheasant populations in Montana.

Development of habitat for pheasants and other wildlife on privately owned land through federal subsidies has had varied success in Montana. The earliest practice of seeding farmland to vegetative cover (1938-72) and the Soil Bank Act of the late 1950's appeared to significantly increase pheasant numbers. Several other farm-habitat development programs failed, for various reasons, to significantly benefit pheasants; in some cases these programs were detrimental to pheasants.

4

MONTANA'S PHEASANTS AND HABITATS

There have been many changes in Montana's rural scene through the years. Some of these changes have occurred so gradually that people living in an area are not fully aware of them. To illustrate, parents may be unaware of year-to-year physical changes in their growing children while distant relatives or friends may be astonished at the changes after a few years absence from them.

Numbers of farms and ranches increased rapidly to a recorded peak of 57,700 by 1920, decreased to 50,000 by 1925, increased to a secondary peak of 55,000 in 1930 and have been decreasing since 1930.[142] (Fig. 7). In 1971 there were 25,800 farms and ranches, 55 percent fewer than in 1920! As the number of farms and ranches decreased, their average size increased; the average unit included 608 acres in 1920 and 2,597 acres in 1971. Farm and ranch size between 1950 and 1971 increased 149 percent!

The small farms provided more pheasant habitat since fields were smaller and had more area in fencerows, field corners and shelterbelts which provided cover for pheasants; in other words, there was more cover diversity and more "edge effect". As farms grew larger, fences and accompanying cover and shelterbelts were ripped out to provide larger and smoother fields for easier cultivation; i.e. removal of cover, less cover diversity and less "edge effect". These large fields are deficient in cover and also in pheasants.

The advent of farming made Montana's valleys and plains habitable for pheasants, but since 1940, farming methods have been reducing pheasant habitat. Cropland grew from a few thousand acres in 1900 to 8.2 million acres in 1970. About 95 percent of this acreage has been occupied by small grains such as wheat, barley, oats and rye. Small grains and corn provide a concentrated food supply which pheasants need, especially in winter. If these crops are grown in small fields near cover areas, they provide good pheasant habitat.

Alfalfa acreage in Montana increased from 300,000 acres in 1919 to 1,200,000 acres in 1970. Between 1950 and 1970 alfalfa acreage statewide increased 163 percent! Alfalfa provides some food for pheasants year around but during the

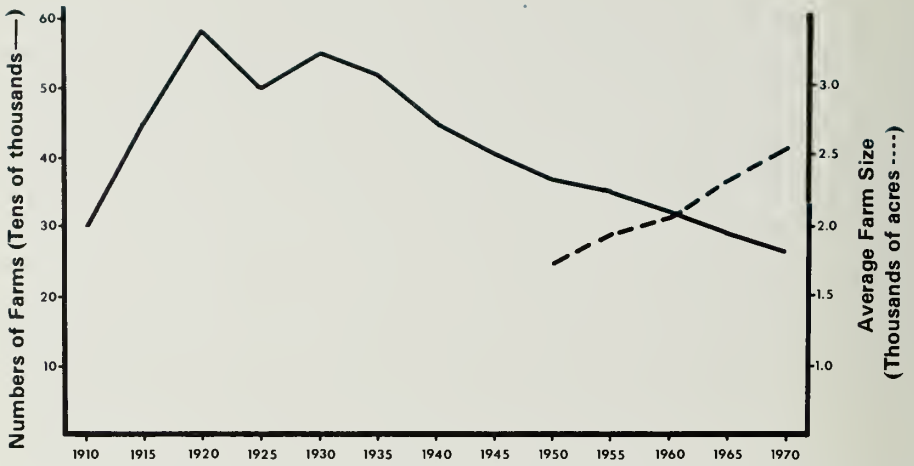


Figure 7. **Numbers of farms (1910-72) and average farm sizes (1950-70) in Montana.**

summer many alfalfa fields are chemically treated for insect control thus removing a critical food source (insects) and contaminating vegetation with toxic material. Pheasants derive some cover value from alfalfa in late spring but this cover can become a death trap for nesting hens. A recent Washington study showed an average of 69 percent of hens incubating nests in alfalfa were killed during mowing operations.[35] Incubating hens were most likely to be on the nest between 11:00 a.m. and 4:00 p.m., the time of day when a great deal of hay cutting occurs. First-cutting dates for alfalfa in Montana counties (Fig. 8) generally occur during pheasant nesting and extend 3 weeks beyond peak pheasant hatching dates. Many nests in alfalfa are destroyed and few hens or flightless chicks survive the mowers. Pheasant nesting in alfalfa, therefore, contributes almost nothing to annual pheasant production.[141]

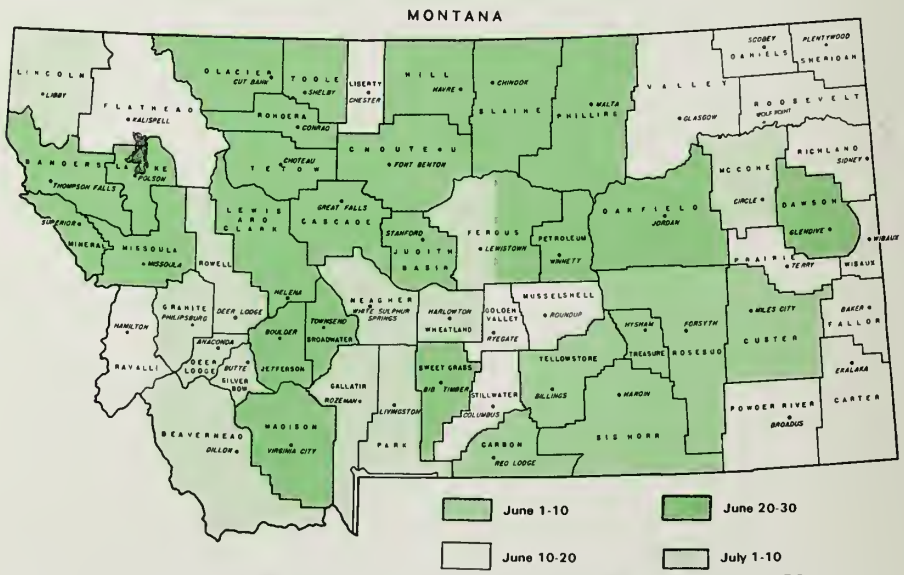


Figure 8. **Average beginning dates of first cuttings of alfalfa in Montana.**

Alfalfa mowing exposed these pheasant eggs and critically injured the hen.
—(Photo by R.J. Fischer)

In recent years, many farmers in the irrigated valleys have found it more profitable to grow beef than cereal grains and have switched from grain farming to production of cattle and forage crops. Numbers of cattle increased from 1.3 million in 1919 to 2.9 million in 1970; numbers increased 163 percent between 1950 and 1970! This has resulted in a further loss of pheasant habitat. The reduction in grain farming has reduced the food supply for pheasants while increased cattle numbers mean more pastures and hayfields. Pastures are heavily grazed and hayfields are mowed and then grazed by cattle; they do not provide much cover for pheasants. Marshes and stream bottoms, which formerly provided good pheasant cover, are now often heavily grazed and no longer provide hiding or nesting places for pheasants.

Modern farm equipment is more efficient in removing cover and killing pheasants than the old horse-drawn or early engine-powered equipment. Farming machinery is now drawn closer to field edges, farther up steep slopes, on road margins and along stream courses so that little cover remains. Fast-moving modern equipment is more difficult for pheasants to evade and many are killed or crippled.

In the remainder of this chapter we have compiled pheasant survey data (Fig. 9) and agricultural crop and livestock trends by the Montana Department of Fish and Game's seven administrative regions. Historical notes for each respective region have been added when available. Each region's discussion, and sometimes local area discussions, concludes with an evaluation of pheasant populations and habitat.

Most of the pheasant survey data in Montana are relatively recent. During 1900-40 pheasant observations were, for the most part, recorded randomly by personnel of the Fish and Game Department and other natural resource agencies,

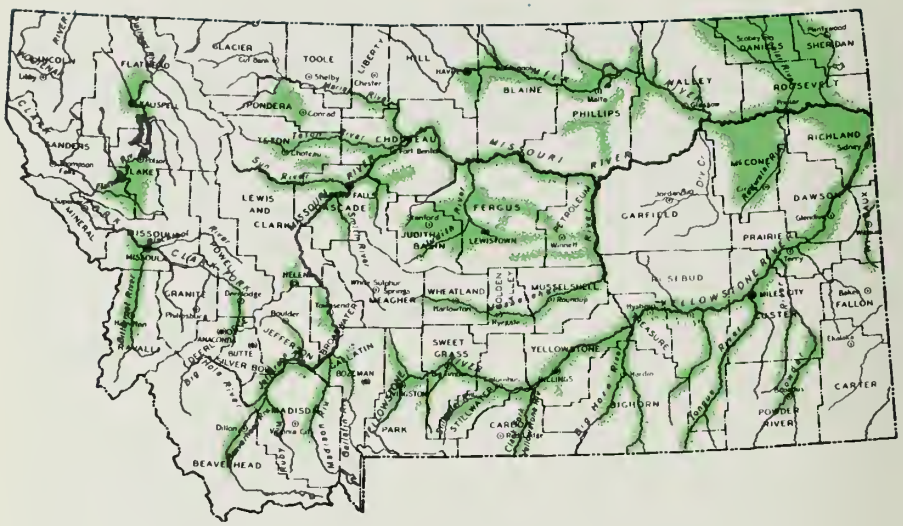


Figure 9. **Ring-necked pheasant distribution in Montana—1974.**

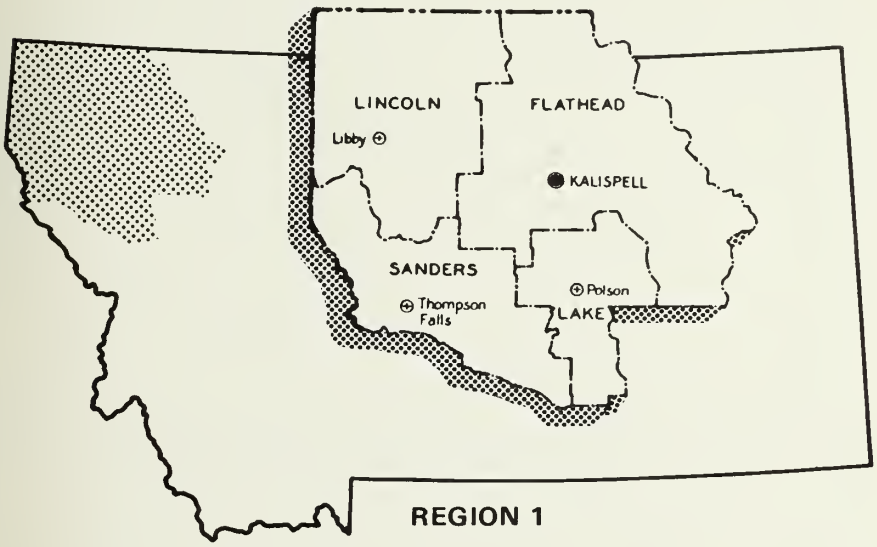
college professors and some sportsmen. Passage of the Pittman-Robertson Act of 1937 encouraged development of wildlife management curricula in colleges by funding wildlife investigations of state game agencies; these studies required the services of specialized college-educated biologists. World War II delayed employing many of the early wildlife graduates. A program of seasonal pheasant surveys in Montana, like many other states, was not developed until the late 1940's. Employing numbers of qualified biologists sufficient to select, supervise and conduct these surveys on a regular, regional basis carried into the mid-1950's. The subsequent regularity with which seasonal surveys were conducted reflects availability of qualified personnel, field work priorities and prevailing weather conditions.

Montana's agricultural records, dating back to the early 1900's, document changes in numbers of farms, farm sizes, crop types and acreages and numbers of cattle. This information reflects gross changes in regional and local pheasant habitats. Crop acreages and cattle numbers are presented at 5-year intervals, 1919-70, except for 1934-40, a 6-year period. During 1919-34 cultivated crops and alfalfa acreages represent acres-harvested whereas 1940-70 acreages are acres-planted. Comparison of these differences revealed that usually 95 percent or more of the acres planted in a given county were actually harvested. For purposes of this bulletin, differences in acres planted vs. harvested are considered minimal and the acreages presented accurately reflect the overall changes and trends which have occurred.

NORTHWEST MONTANA

The two principal pheasant ranges in northwest Montana occur in farming areas in the Flathead Valley. One area lies north of Flathead Lake and is characterized by dryland farming. Sprinkler irrigation is becoming increasingly popular in

this area, however, and dryland status may not last indefinitely. A majority of the second area, south of Flathead Lake, contains irrigated farm and range land with dryland agriculture practiced along the outer fringes.



Pheasant Surveys

Flathead, Lake and Lincoln Counties were among the first in Montana to receive pheasant stock in the early 1900's. By 1926, complaints of pheasant damage to crops near Polson were filed. Complaints of pheasant damage to home garden vegetables and strawberries were also received from Flathead Valley residents during the 1940's.

Pheasant abundance in northwest Montana has fluctuated widely but has generally declined since the early 1950's. Crowing cock counts in the Kalispell-Four Corners area decreased 79 percent between 1954 and 1973 (Fig. 10); the 1972-count was the 19-year low count. In the Moiese-Ninepipe area, crowing counts decreased 90 percent between 1947 and 1973; the 1973-count was the lowest recorded in 26 years!

Late summer indices of relative pheasant abundance showed a 78 percent decrease from 1954 to 1968 in the Lower Flathead Valley (Fig. 11).

Information from hunters interviewed at the Ravalli check station indicated popularity of the area for pheasant hunting had decreased noticeably between 1948 and 1972 (Fig. 12). Numbers of hunters decreased 95 percent during these 24 years! Hunters' bags on opening day of hunting seasons during this period averaged 129 pheasants per 100 hunters. The average opening day bags were above the 24-year average during 11 years and below this average during 13 years. The average time expended to bag each bird was 2½ times greater during 1963-72 (4.1 hours) than during 1953-62 (1.9 hours).

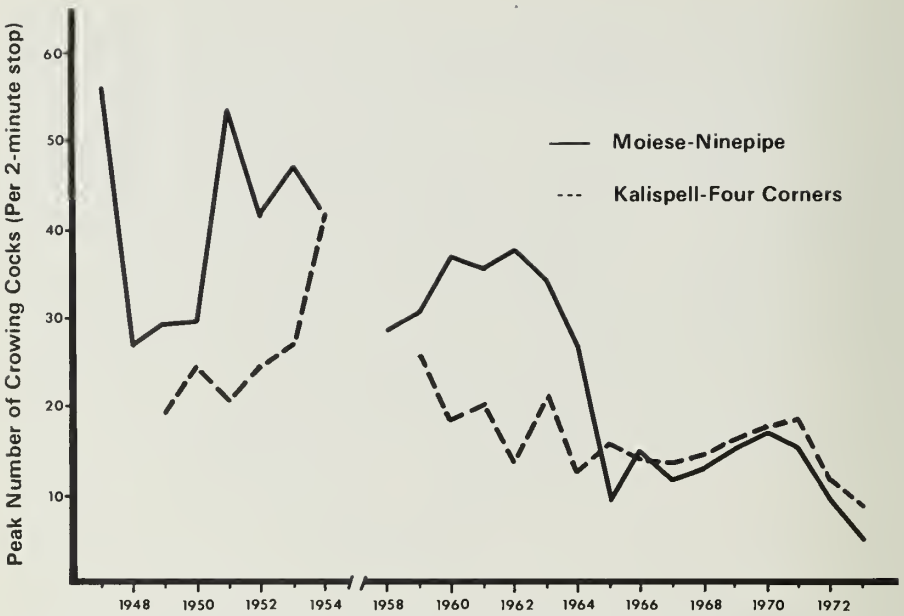


Figure 10. **Peak crowing cock counts in northwest Montana, 1947-73.**

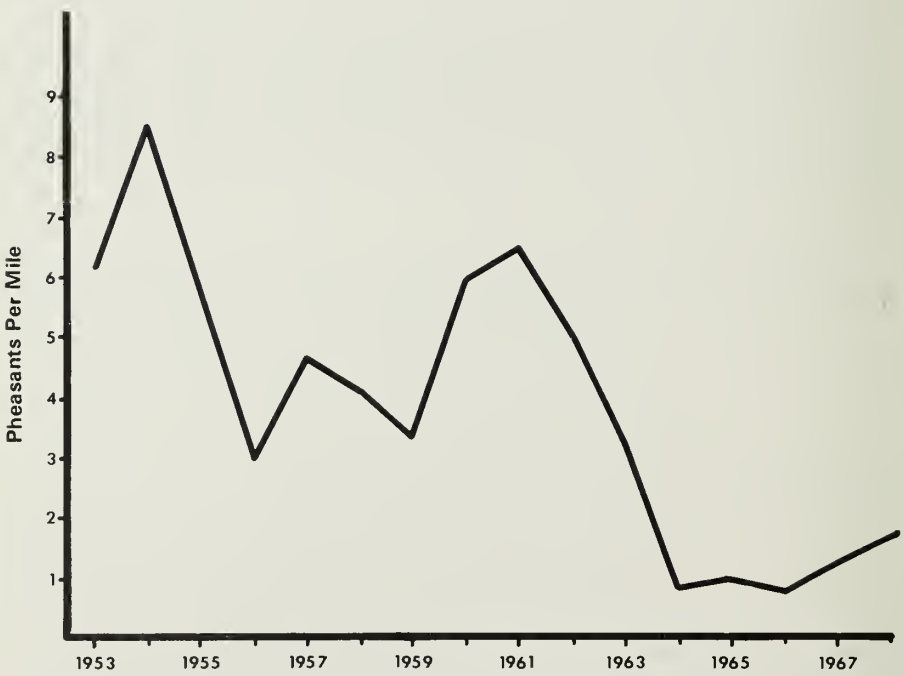


Figure 11. **Relative pheasant densities in late summer in the lower Flathead Valley, 1953-68.**

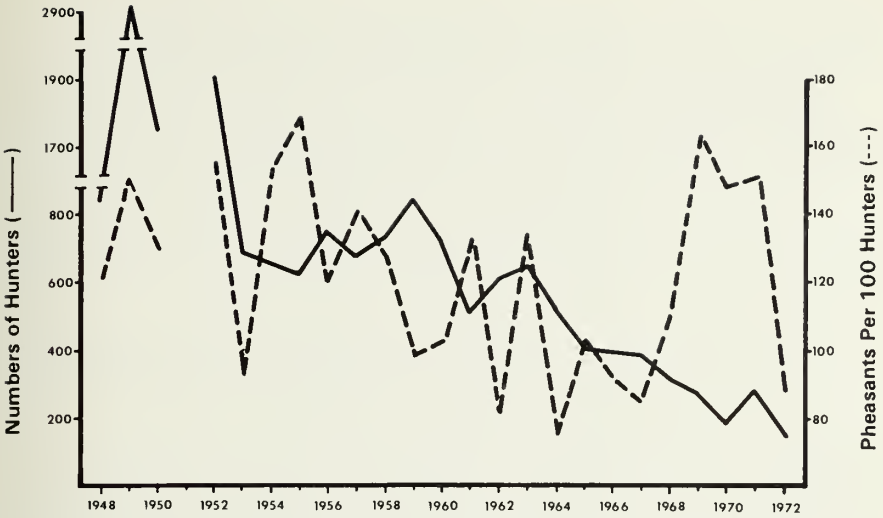


Figure 12. **Trends in numbers of pheasant hunters and in pheasant harvested per 100 hunters on opening day in the Flathead Valley, 1948-72.**

Regional pheasant harvests decreased 71 percent from 1958 to 1973 (Table 16); the 1973 estimated harvest of 7,315 pheasants was the lowest recorded during these 16 years!

Age determination of pheasant cocks submitted by hunters in the Flathead Valley showed 67 to 89 percent of the opening day or weekend harvest were juveniles

Table 16. **Annual pheasant harvests in northwest Montana, 1958-73.**

Year	Number of Pheasants Harvested	Percent Statewide Harvest
1958	25,180	11
1959	22,210	13
1960	19,649	13
1961	23,878	14
1962	22,078	12
1963	24,785	8
1964	14,320	4
1965	9,140	9
1966	19,610	9
1967	8,770	9
1968	11,131	12
1969	13,449	12
1970	11,141	12
1971	9,689	11
1972	8,454	12
1973	7,315	8
Average Harvest	15,674	—

(Table 17). Annual production appears adequate for population maintenance in each year sampled, yet pheasant abundance has decreased.

Game farm pheasant release and band return records for eight years revealed an average of 11 percent of the released birds were bagged by hunters (Table 18). The remaining 89 percent served as food for predators and scavengers.

Winter sex ratios, 1946-73, showed no shortage of cocks for breeding stock. Ratios ranged from 157 to 376 hens per 100 cocks and averaged 275 hens per 100 cocks during 18 winters (Table 19). If anything, there was still a surplus of cocks during the winter.

Pheasant population indices indicate the birds are performing "normally". The decreasing population reflects environmental, not population, inadequacies.

Crop and Livestock Trends

Agricultural records show an early peak in cropland (non-hay) acreage occurred in the region about 1919 (Fig. 13). This was followed by a short decline and a leveling-off period until World War II. By 1950 an all-time peak of 154,700 acres was reached. From 1950 through 1965 there was a sharp, constant decline; in 1970

Table 17. **Percent juveniles in cock harvests on opening day or weekend in Lake County,[A] 1948-72.**

Year	Numbers of Cocks Aged			Precent Juveniles
	Adults	Juveniles	Total	
1948	—	—	—	83
1949	—	—	—	80
1950	—	—	—	85
1954		—	—	84
1956	177	731	908	81
1957	244	728	972	75
1958	247	694	941	74
1959	272	548	820	67
1960	148	594	742	80
1961	177	498	675	74
1964	34	272	306	89
1965	43	249	292	85
1968	38	313	351	89
1969	—	—	—	89
1970	—	—	—	87
1971	81	231	312	74
1972	39	99	138	72

[A] Pheasants examined at the Ravalli check station.

Table 18. **Numbers of game farm pheasant cocks released and bands returned by hunters in northwest Montana.**

Year Released	Number Released	Bands Returned	
		Number	Percent
1950	995	163	16
1958	600	74	12
1967	2,973	544	18
1968	2,767	64	2
1969	2,596	433	17
1970	2,075 [A]	347	17
1971	2,694 [B]	97	4
1972	2,622 [C]	62	3
Totals	16,317	1784	11 (Avg.)

[A] 1,775 mixed sexes plus 300 hens.
[B] 2,043 mixed sexes plus 651 cocks.
[C] 1,870 mixed sexes plus 852 cocks.

there were only 84,700 acres in crop production. The major portion, 95 to 99 percent, of the acreage for the past 45 years has been small grains.

Alfalfa was cultivated on only 7,000 acres in 1919 but increased to 76,000 acres by 1945 (Fig. 13). By 1965, alfalfa was grown on 90,000 acres.

Livestock trends corresponded to those of alfalfa acreages, with progressively higher peaks in 1945, 1955 and 1970 (Fig. 13). Montana Department of Fish and Game biologists in 1950 reported that numbers of horses, dairy cattle and sheep had declined but that numbers of beef cattle had more than absorbed the differences. Approximately 142,500 beef and dairy cattle were recorded for this region in 1970.

Pheasant Population and Habitat Evaluations

The Flathead Valley was characterized by numerous, small diversified farms during the 1930's and 1940's. The many property boundaries and farm implements of the period resulted in numerous weedy fencerows and idle corners. Cattails and grass cover bordered stream courses, potholes and irrigation ditches. Complaints were voiced about pheasants damaging potato crops and newly seeded small grains. Farmers and hunters may still remember the thriving pheasant populations of that time; they may or may not remember the abundant vegetative cover!

Reporters of one of Montana's earliest pheasant studies[144] recognized pheasants occupied the stream courses and brush adjoining agricultural land. During 1942-43 these investigators stated: "Literally thousands of young pheasants were seen in the Flathead Valley in late August and early September . . ." Pheasant populations had already begun their downward plunge at this time and reached all-time low numbers by 1945.

Concern for the welfare of pheasants prompted the Montana Fish and Game Department to establish five pheasant refuges in the Flathead Valley about 1945

Table 19. **Winter sex ratios of pheasants in the Flathead Valley, 1946-73.**

Winter of:	Numbers of Birds Sexed			Hens Per 100 Cocks
	Cocks	Hens	Total	
1946-47	332	586	918	177
1948-49	598	1,378	1.976	230
1949-50	174	456	630	262
1951-52	183	595	778	325
1958-59	81	305	386	376
1959-60	543	1,929	2,472	355
1960-61	423	1,167	1,590	276
1961-62	297	1,086	1,383	366
1962-63	213	618	831	290
1963-64	52	139	191	267
1964-65	171	455	626	266
1965-66	62	189	251	304
1966-67	66	245	311	376
1967-68	—	—	—	270
1968-69	150	235	385	157
1969-70	131	312	443	238
1970-71	65	139	204	209
1972-73	145	288	433	199
Totals	3,686	10,122	13,808	275 (Avg.)

(see Refuges). During 1946-47, five additional refuges were established. Only two refuges received pheasant use during the winter 1946-47 in spite of sub-zero temperatures in January 1947 and below normal temperatures during much of that winter. The winter of 1947-48 was mild and pheasants made little or no use of the refuges, food and grit.

In February 1946, another investigator found[145] " . . . the whole *(Flathead)** valley had been used much more intensively by *(live-)* stock than in former years. This has had a pronounced effect rendering many sections of the valley without any suitable habitat at all. It appeared that the abundance of birds on any section of land was roughly proportional to the amount of cover present." During an August, 1946 pheasant survey in the Flathead Valley it was further reported:[146] "Pheasant cover has been reduced at least 25% since 1942".

Surveys during the summer of 1947 revealed irrigation water had flooded many pheasant nests. Although many hay mowers were still drawn by horses, some tractors with mowing attachments were noted. One pheasant nest was destroyed for every 3.8 acres of alfalfa or wild hay mowed and one hen was killed for every 12.7 acres mowed.

**Words added by authors to clarify meaning.*

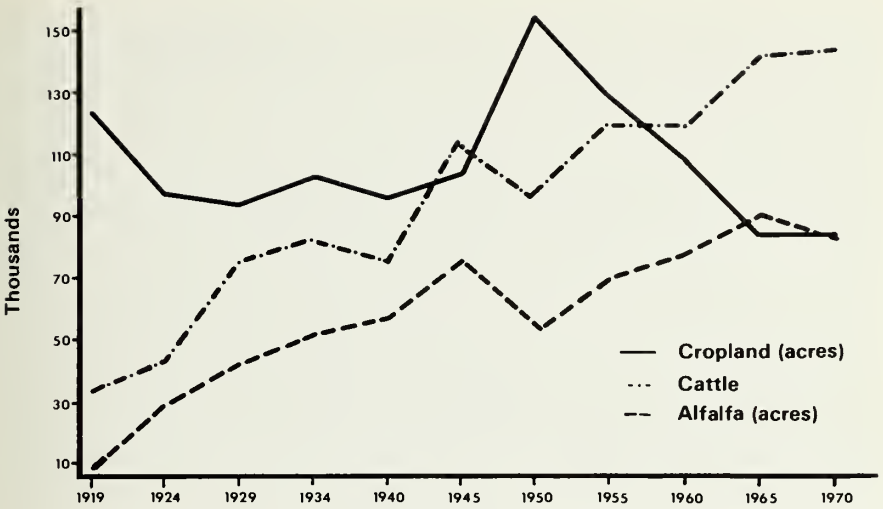


Figure 13. **Trends in grain crop and alfalfa acreages and cattle numbers in northwest Montana, 1919-70.**

After inspecting pheasant habitat in Lake County in late December, 1948, an out-of-state wildlife professor stated:[132] "At the present rate of land use intensification this region is going to lose some of its high class cover before long. Food conditions *(for pheasants)* usually improve where agriculture is intensified, but cover conditions will retrograde." He also recommended Department-acquisition of three or four patches of several acres' size along weedy draws, cattail marshes, rough land or creek borders on each 80 acres of farmland. State Fish and Game Department biologists, heeding this advice, contacted farmers in the St. Ignatius area regarding selling or leasing small tracts of wasteland to the Department for preservation as pheasant cover. In most cases the land owner flatly stated he wasn't interested in selling or leasing any waste tracts as he didn't desire more pheasants on his property.

Habitat surveys during 1948-51 reported fall and spring burning of waste areas, along fencerows and railroad rights-of-way. Fall plowing of stubble was a common practice in the late 1940's. No pheasant production was found in native grassland, spring planted grain, grazed pastures or sweet clover harvested in mid-June. Chopped alfalfa produced only one-half the chicks that unharvested alfalfa produced. *Greatest pheasant production was found in the tall, weedy cover of wastelands.*

Thousands of acres of cropland which produced grain (food for pheasants) prior to 1950, now produces alfalfa (food for cattle). The first alfalfa cutting occurs about June 20 each year. The average peak week of pheasant hatching in the Flathead Valley occurs June 10-16. About one-half of the total annual pheasant production hatches during the first 3 weeks in June. In a "normal" year alfalfa mowers move into the fields when about half of the pheasant chicks are hatched but are not yet strong fliers. Mowing alfalfa at night is especially disastrous to the chicks. During years having "early springs" pheasant production might be unusually successful due to earlier hatching. Conversely, in a "late spring" year, pheasant production in alfalfa-growing areas can be eliminated entirely.

Irrigated pastures have replaced many of the smaller grain fields in the Charlo area. *—(Photo by J.P. Weigand)*

Development of insecticides and their use since the 1940's to control alfalfa insects on the increasing alfalfa acreages has undoubtedly added to the pheasants' problems.

Current pheasant range in northwest Montana is limited; major farmland uses are cattle-grazing and alfalfa-growing. Irrigated pastures are grazed with such intensity that little cover for pheasants exists at any time of the year. Fencelines are denuded of vegetation in these areas. Agriculturally-idle areas are virtually non-existent. Borrow pits, which contain some of the only residual vegetation, are burned each spring. Increased county weed-control programs annually reduce the forb-grass cover preferred by nesting pheasants. Small grains are limited to drylands bordering the irrigated valley and on Department-owned wildlife management areas.

Pheasant habitat along edge of irrigated area near Polson. *—(Photo by J.P. Weigand)*

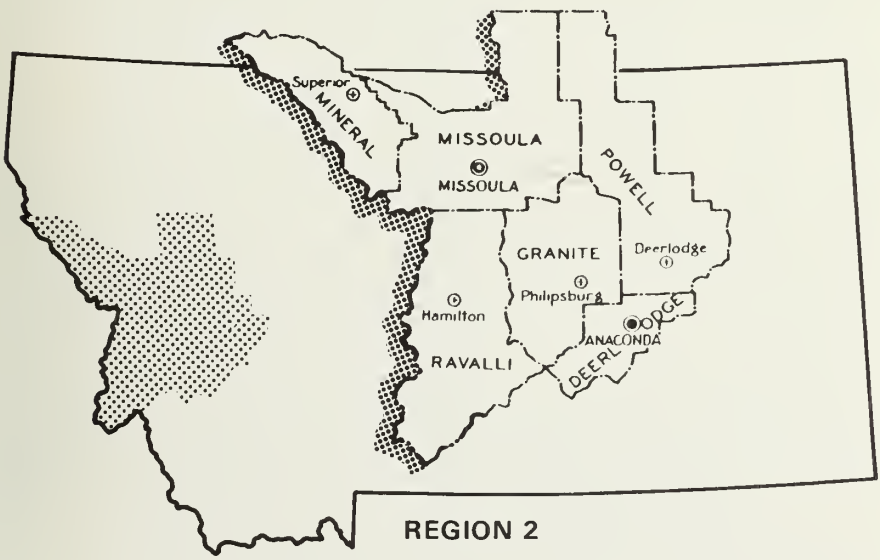
Mild winters characteristic of this region no doubt contributed to early pheasant establishment and high populations. They could continue to benefit pheasants if there were adequate safe nesting, brood and protective cover. The dominant winter cover for pheasants north of Flathead Lake occurs along the Flathead River and its feeder-streams. South of Flathead Lake, woody vegetation along streams and heavy vegetation in sloughs provides winter cover. Pheasant populations will decline further if more of this cover is removed.

Subdividing land for home and recreational pursuits (other than pheasant hunting) increased during the 1960's and early 1970's in Flathead and Lake Counties. The impact of subdivisions on pheasants in this region has not been evaluated. Nonetheless, replacing pheasant habitat with concentrations of homes for people can be expected to further erode the base of pheasant populations in the same manner as expansion of cities into adjacent farmlands.

Pheasant habitat condition in northwest Montana is currently considered as poor to fair. Although Lake County yielded more pheasants per acre than any other Montana county in 1972, such recognition is dubious when compared to northwest Montana pheasant abundance during the 1940's and 1950's. Unless pheasant habitat management is incorporated into farm planning, or unless there is a major change in land uses and management practices, the future for pheasants in this region leaves much to be desired.

WESTCENTRAL MONTANA

Major pheasant range in westcentral Montana lies in the Bitterroot River Valley from Hamilton to Frenchtown. It was a popular pheasant hunting area for local hunters until the mid-1960's.



Pheasant Surveys

Pheasant crowing counts have been conducted each spring in various parts of the Bitterroot Valley since 1949. At least 12 different crowing count routes were surveyed during 1949-73 but 9 routes yielded only short-term information. Counts along the remaining 3 routes illustrate long-term pheasant spring population levels

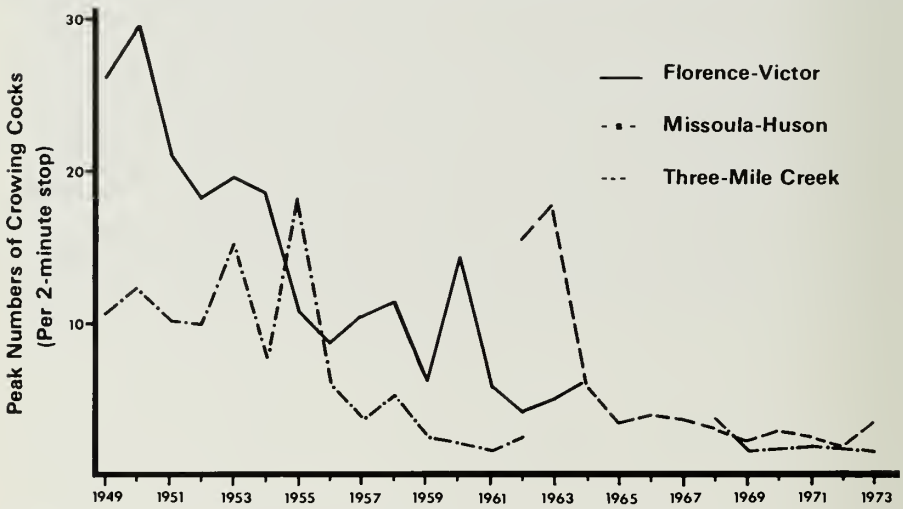


Figure 14. **Peak crowing cock counts in westcentral Montana, 1949-73.**

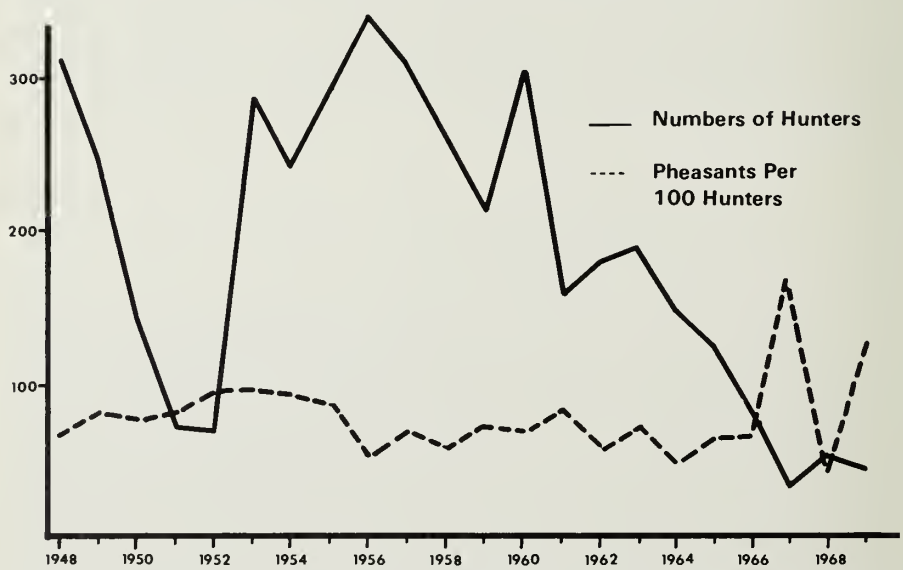


Figure 15. **Trends in numbers of pheasant hunters and in pheasants harvested per 100 hunters on opening day[A] in the Bitterroot Valley, 1948-69.**

[A] 2 check stations 1953-67; 1 check station in remaining years.

(Fig. 14). Numbers of crowing cocks decreased 86 percent between 1950 and 1962 along the Florence-Victor Route; little population recovery was noted after 1962. In the Missoula-Huson area crowing counts decreased 91 percent between 1955 and 1961. There was an 88 percent decrease in crowing cocks along Three-Mile Creek between 1963 and 1972.

Roadside counts in late summer declined from 2.5 birds per mile in 1952 to less than 0.1 birds per mile in 1967; this represented a 96 percent decrease in relative pheasant density in summer. Recovery of the population, reflected by this index, had been barely noticeable through 1972.

The declining pheasant population has resulted in reduced interest in local pheasant hunting. Bitterroot check stations recorded a peak of 348 pheasant hunters checked on opening day in 1956, and a gradual drop to 219 hunters in 1959 (Fig. 15). The brief upswing of pheasant numbers in 1960 resulted in a temporary increase in hunter numbers. Between 1960 and 1966 there was a 74 percent decrease in numbers of hunters interviewed at the check stations! An average of only 44 hunters, 1967-69, stopped at the check station north of Hamilton. No check station has been operated in the Bitterroot Valley since 1969 due to the low hunting pressure. Proportions of juveniles in the opening day or weekend cock harvests during 1948-64 ranged from 79 to 91 percent, reflecting very good production in all years sampled.

Westcentral Montana's pheasant harvest decreased 85 percent between 1963 and 1973 (Table 20). The two top pheasant harvest (birds per acre) counties during 1967-73 were Deer Lodge and Ravalli; Missoula County ranked third in county pheasant-harvests (Table 21).

Fourteen percent of the bands from 5,589 game farm pheasant cocks released

Table 20. **Annual pheasant harvests in westcentral Montana, 1958-73.**

Year	Pheasants Harvested	Percent Statewide Harvest
1958	8,085	4
1959	8,394	5
1960	7,231	5
1961	7,959	5
1962	6,281	3
1963	8,984	3
1964	4,296	1
1965	2,470	2
1966	3,095	1
1967	2,018	2
1968	2,147	2
1969	2,633	2
1970	2,700	3
1971	1,459	2
1972	1,520	2
1973	1,308	1
Average Harvest	4,411	—

Table 21. **County pheasant harvest-ranking in westcentral Montana, 1967-73.**

Year:	1967	1968	1969	1970	1971	1972	1973
Regional Rank:							
1	(Deer Lodge &	Deer Lodge	Deer Lodge	Ravalli	Ravalli	Deer Lodge	Deer Lodge
2	Ravalli)	Ravalli	Ravalli	Deer Lodge	Deer Lodge	Ravalli	Mineral
3	Missoula	Missoula	Missoula	Powell	Missoula	Missoula	Ravalli
4	Powell	Powell	Powell	Missoula	Powell	Powell	(Missoula &
5	Granite	Granite	Granite	Granite	Mineral	Granite	Powell)
6	Mineral	Mineral	Mineral	Mineral	Granite	Mineral	Granite

in westcentral Montana, 1960-68, were subsequently returned by hunters (Table 22). During 1963-68 game farm cocks comprised an average of 45 percent of the total cocks examined at the Bitterroot check station (Table 23). The increasing proportion of game farm birds, 1963-67, in the opening day harvest strongly suggests a declining resident pheasant population.

Crop and Livestock Trends

Agricultural records showed the all-time high in regional cropland (primarily cereal grain) acreage occurred about 1919 (Fig. 16). This high was followed by a

Table 22. **Numbers of game farm pheasant cocks released and bands returned by hunters in westcentral Montana, 1948-68.**

Year	No. Banded Pheasants Released	Bands Returned	
		No.	%
1948	554	86	16
1950	995	163	16
1953	398	111	28
1960	856	233	28
1961	290	15	5
1964	340	63	18
1965	1,130	165	15
1966	1,063	94	9
1967	810	118	15
1968	1,000	87	9
Total	7,436	1,135	15 (Avg.)

Table 23. **Contribution of game farm pheasants to opening day harvests in the Bitterroot Valley, 1963-68.**

Year	Pheasant Cocks Harvested			Percent Game Farm Pheasants
	Wild	Game Farm	Total	
1963	85	15	100	15
1964	43	31	74	42
1965	43	37	80	46
1966	16	37	53	71
1967	10	43	53	81
1968	13	9	22	41
Totals	210	172	382	45 (Avg.)

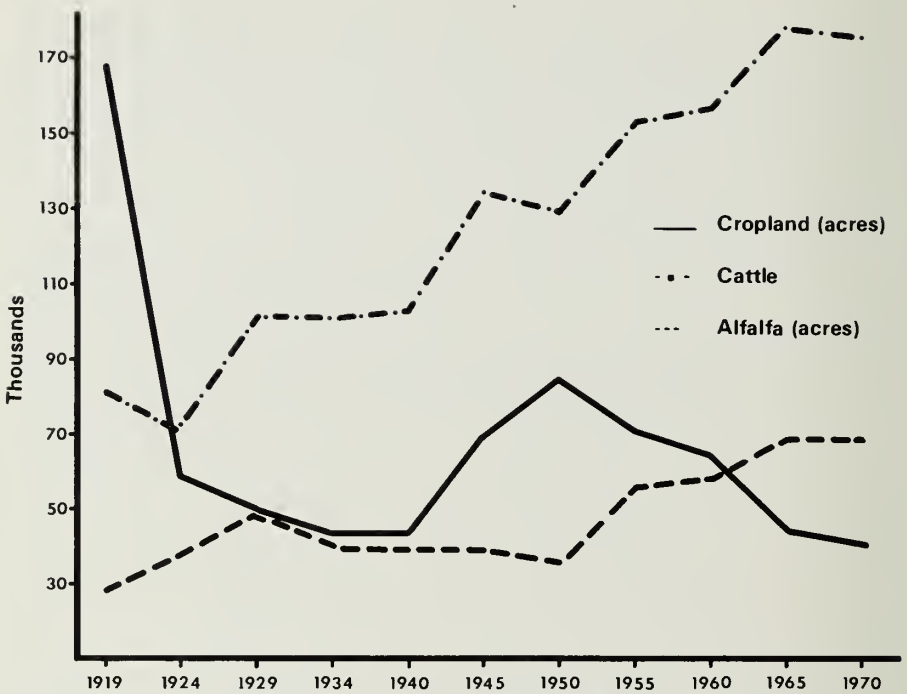


Figure 16. **Trends in grain crop and alfalfa acreages and cattle numbers in westcentral Montana, 1919-70.**

rapid decline in crop acreage (down 73 percent) by 1934. A secondary peak in 1950 has been followed by a second, continuing decline. The all-time low crop acreage (other than hay) was recorded in 1970; there was a 53 percent decrease in crop acreage between 1950 and 1970. An average 99 percent of all crops were small grains from 1919 to 1940; from 1945 to 1965 small grains averaged 88 percent of the crops planted. While small grains are still grown in the region they are mostly limited to the foothills. These areas may include some elk and deer winter range but they are not primary pheasant range.

Alfalfa acreages increased rapidly from 1919 to 1929 and then declined slowly until 1950 (Fig. 16). Between 1950 and 1965 alfalfa acreage increased 194 percent. A slight decline occurred between 1965 and 1970. Alfalfa has exceeded other cropland acreage since the early 1960's.

Cattle numbers have also increased steadily, except for minor decreases in 1924, 1950 and 1970 (Fig. 16). The 174,500 cattle grazing westcentral Montana ranges in 1970 were more than double those present during the 1920's.

Pheasant Population and Habitat Evaluations.

The Bitterroot Valley was among the earliest pheasant release sites in Montana. Habitat was so favorable and pheasants increased so rapidly that sportsmen in Missoula and Ravalli Counties petitioned the State Fish and Game Commission to allow pheasant hunting in 1926. Hunting regulations in the region remained conservative until 1963 when one hen was allowed in the 3-bird daily bag limit. The breeding population had declined 86 percent (1949 to 1962) before hen shooting

was allowed. During 1964-68, pheasant populations failed to respond upward in spite of re-imposed cocks-only hunting seasons. Limited hen harvests were again permitted in 1969-72 with little noticeable effect on pheasant populations.

Changes in land uses in the Bitterroot Valley seems to parallel those of the Flathead Valley in northwest Montana. While farm numbers have probably remained about the same in the Bitterroot area, the acreage of small grain crops has decreased significantly, alfalfa acreage has almost doubled and cattle numbers increased by 136 percent between 1950 and 1970.

Average first cutting dates for alfalfa are earliest in Ravalli County (June 11-20). First cuttings in Missoula County occur about June 21-30 and after June 30 in Deer Lodge, Granite, Mineral and Powell Counties. The peak week of pheasant hatching in the Bitterroot Valley is June 5-11; the 3-week peak of hatch occurs during May 28-June 17. In an average year most of the pheasant nests in alfalfa in

Fields along Three-Mile Creek used to support grain and pheasant; now it grows only alfalfa and cattle. *(Photo by J.P. Weigand)*

Intensively grazed orchards and creek banks no longer furnish cover for pheasants in the Bitterroot Valley. *(Photo by J.P. Weigand)*

the Ravalli County portion of the Valley would be destroyed. Many nesting hens and flightless chicks would be killed at this time also. In Missoula County, cutting in the Valley would kill many of the chicks in alfalfa.

Evidence of land-use changes in the Bitterroot Valley was obtained by field measurements of various cover types along the east and west sides of the Valley (Table 24). With the current orientation toward beef production, most pastures, abandoned orchards, stream courses and woody cover are intensively grazed. Because winters tend to be mild, winter cover may not be as critical as in other Montana regions. However, the overall lack of nesting, brood and general protective cover, combined with limited food sources, has relegated the area's pheasant carrying capacity to a very low level.

Table 24. **Percent of habitat types in the Bitterroot Valley, 1954-71.**

Habitat Type	1954	1959	1960	1971
Hay	21	19	27	27
Pasture	45	53	56	48
Grain Crops	18	11	8	6
Row Crops	2	2	2	2
Orchards-Gardens	2	3	1	1
Brush, Trees and Wastelands	11	11	7	16[A]

[A] Included some areas classified as Pasture in previous years.

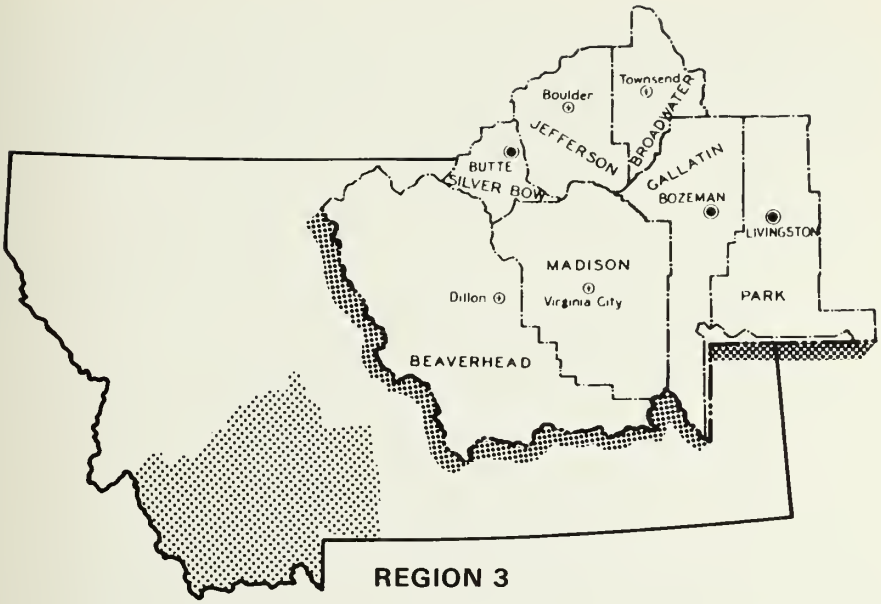
The present status of westcentral Montana pheasant range, by any standard, is very poor. The future outlook for pheasants is not very bright either. If the agricultural land-uses of the area could be returned to grain crops on the floodplains with brushy, ungrazed stream courses and interspersed grasslands, the area could again be a good pheasant producer. Until that occurs, westcentral Montana will not provide much pheasant hunting.

SOUTHWEST MONTANA

Principal pheasant ranges in southwest Montana occur along the lower portions of the Jefferson, Madison and Gallatin Rivers, the Missouri River and the Yellowstone River near Livingston. Land adjacent to tributaries of these rivers also provides some pheasant habitat. Floodplains are generally irrigated with remaining farmland being dryland. In recent years, mobile, above-ground irrigating systems have become popular on some dryland areas.

Pheasant Surveys

Data regarding pheasant populations in this region are largely incomplete for any given survey. Hunters are generally more interested in elk and deer management and the Department of Fish and Game has responded with a majority of survey work on these species and their environment.



Pheasant crowing counts, begun in 1951, showed an 88 percent decrease in the Dillon area and an 84 percent decrease in the Toston-Townsend area within 8 years (Fig. 17). A 1966 crowing count in the Toston-Townsend area indicated spring cock populations had dropped 96 percent between 1951 and 1966!

Figure 17. **Peak crowing cock counts in southwest Montana, 1951-59.**

Numbers of hunters interviewed at the Townsend check station declined from 124 hunters in 1963 to 46 hunters in 1968 (Fig. 18). Pheasants bagged per 100 hunters decreased from 101 in 1962 to 32 by 1966; this represented a 68 percent decrease in hunting success within 7 years. The hours required to bag each pheas-

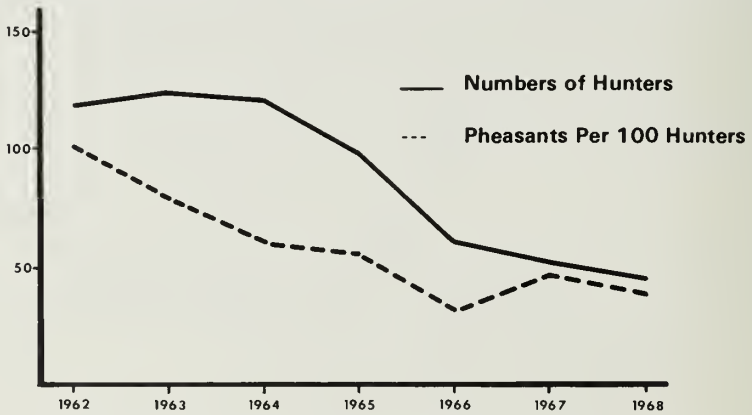


Figure 18. **Trends in numbers of hunters and in pheasants harvested per 100 hunters on opening day near Townsend, 1962-68.**

ant increased from 3.8 in 1962 to 8.9 in 1968; almost 2½ times as much hunting time was required to bag each bird in 1968 as compared to 1962! The regional pheasant harvest decreased 90 percent from 1958 to 1972 (Table 25). Broadwater and Gallatin counties ranked first and second in harvest per acre, 1967-73 (Table 26).

Table 25. **Annual pheasant harvests in southwest Montana, 1958-73.**

Year	Pheasants Harvested	Percent of State Harvest
1958	17,326	8
1959	14,165	8
1960	13,361	9
1961	13,548	8
1962	15,036	8
1963	15,490	5
1964	15,037	4
1965	6,450	6
1966	5,750	3
1967	4,142	4
1968	3,184	3
1969	4,286	4
1970	2,808	3
1971	3,123	4
1972	1,783	3
1973	1,890	3
Average Harvest	8,586	—

Table 26. **County pheasant harvest-rankings in southwest Montana, 1967-73.**

Year:	1967	1968	1969	1970	1971	1972	1973
Regional Rank:							
1	Broadwater	Broadwater	Broadwater	Broadwater	Broadwater	Broadwater	Jefferson
2	Gallatin	Gallatin	Gallatin	Gallatin	Gallatin	Gallatin	Gallatin
3	Park	Park	Jefferson	Park	Jefferson	Jefferson	Broadwater
4	Madison	Jefferson	Madison	Madison	Madison	Park	Silver Bow
5	Jefferson	Madison	Park	Jefferson	Park	Silver Bow	Madison
6	Silver Bow	Silver Bow	Beaverhead	Silver Bow	Silver Bow	Madison	Beaverhead
7	Beaverhead	Beaverhead	Silver Bow	Beaverhead	Beaverhead	Beaverhead	Park

Stocking game farm-reared pheasants began in 1930 in southwest Montana; between 1930 and 1967 almost 110,000 of these birds were released. Montana's first study of game farm pheasant releases was also conducted in southwest Montana, 1948-49.[134] Thirteen percent of the bands from cocks released in Gallatin Valley in 1948 and 15 percent of the 1949-bands were returned by hunters. Game farm birds made up only 4 percent of all pheasants bagged! Records of band returns for 12 years indicates an average of only 15 percent of the stocked pheasants are harvested by hunters (Table 27). Although the futility of attempting to maintain pheasant populations by stocking has been recognized for 25 years, apparently demands of hunters and landowners are being met through continuance of this program.

Grain crops adjacent to weedy cover along Dry Creek north of Belgrade provides limited pheasant habitat. *(Photo by J.P. Weigand)*

The expanding alfalfa-cattle complex in Montana has resulted in decreased pheasant range and numbers. *(Photo by J.P. Weigand)*

Table 27. **Number of game farm pheasants[A] released and bands returned by hunters in southwest Montana, 1948-68.**

Year	No. Pheasants Released	Bands Returned	
		No.	%
1948	86	11	13
1949	289	42	15
1957	1,916	287	15
1960	675	122	18
1961	1,051	150	14
1962	250	119	48
1963	360	114	32
1964	700	49	7
1965	1,250	186	15
1966	400	41	10
1967	580	87	15
1968	610	2	1
Totals	8,167	1,210	15

[A] Includes hens in years when hens were legally harvested.

Crop and Livestock Trends

Southwest Montana agricultural trends have corresponded to those in westcentral and northwest Montana. Cropland acreage (other than hay) peaked about 1919 and then declined to the 50-year low acreage in 1934 (Fig. 19). A second peak in cropland occurred in 1950; croplands have been declining since 1950. Approximately one-third of the cropland has been lost since 1950.

Alfalfa acreages reached a secondary peak about 1929, declined briefly, and then increased to the all-time peak in 1970 (Fig. 19). In 1970, alfalfa acreage almost equalled that of cropland. Much of the 100,000-acre loss of cropland, 1950-70, is believed to have been absorbed by the 81,000-acre increase in alfalfa. The remaining acreage was probably converted to rangeland for increased numbers of cattle.

Cattle numbers were relatively stable from 1919 through 1940 (Fig. 19). Cattle have continued to increase in the region since World War II. In 1970, there were over 450,000 beef and dairy cattle in southwest Montana, more than twice as many as the pre-World War II era.

Pheasant Populations and Habitat Evaluations

In spite of repeated pheasant releases, starting in 1937-38, and several years of closed pheasant hunting seasons in the Shields River Valley, pheasant populations did not expand to levels desired by sportsmen or landowners. In 1943 local sportsmen and a Department biologist censused the area and found pheasants were confined to the brushy areas along the river bottom. It was concluded that the shortage of food was a critical factor in limiting pheasant numbers and that "future planting

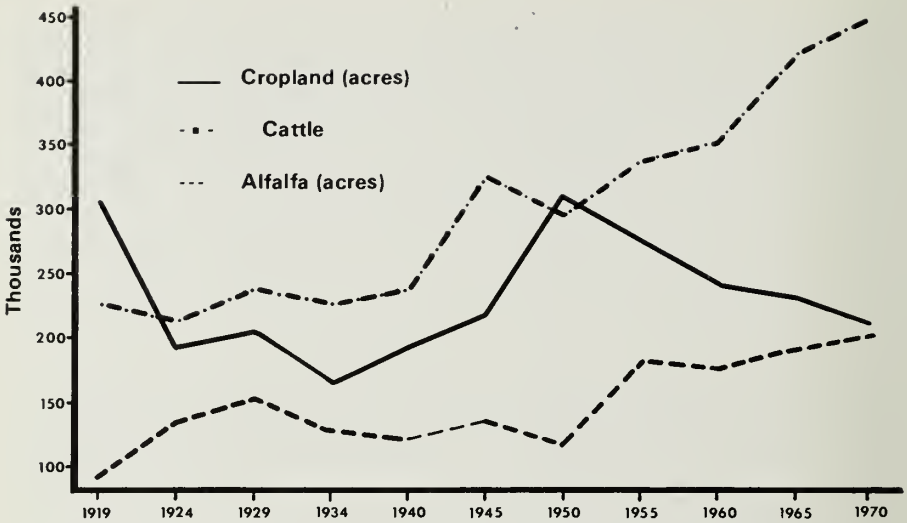


Figure 19. **Trends in grain crop and alfalfa acreages and cattle numbers in southwest Montana, 1919-70.**

*(of game farm pheasants)** in this area will not provide more birds for the hunters. The area is apparently stocked to its carrying capacity now."

In November-December, 1945, six food shelters (in refuges) were constructed in Gallatin County. Local sportsmen kept the food hoppers full and piles of gravel (for grit) replenished. Although heavy pheasant use of these shelters was noted the winters of 1946-47 and 1947-48, pheasant populations did not flourish and eventually the shelters were abandoned.

About the time cropland acreage peaked in this region (1948-49), Edwin Roby was looking for an area in which to study the results of stocking game farm pheasants. He reported:[134]

> "The area selected for the study is an agricultural area northwest of Bozeman in the Gallatin Valley. General land use practices and natural topography make the area well suited for pheasants. Much of the land is used for the production of cereal grains providing a food supply. Excellent cover, well interspersed with grain fields, is found along the banks of many streams, roadsides and numerous small swampy areas. Willow, chokecherry, rose, cattail and hawthorn are found along roadsides and streambanks. The many fencerows contain Canadian thistle, gooseberry, rose and tall grasses."

Hunters who can recall hunting at that time probably remember pheasants were relatively abundant; they may or may not remember the diverse cropland, weedy and woody cover.

There is still some small grain grown in the Gallatin Valley and Radersburg-Toston area. Some of the grain fields are extremely large and offer pheasants little vegetative cover along the borders. Much of the grain today is winter wheat; stubble and waste grain are plowed under in the fall removing potential winter feeding cover and food sources for pheasants. Except for the current crop-yielding summer, winter wheat acreages are barren. Many small grain fields are located in the

*Words added by the authors to clarify meaning.

Potentially good pheasant habitat in the Bozeman-Three Forks area is reduced in value through fall plowing of grain stubble. *(Photo by R.A. Rothweiler)*

foothills. Since these areas tend to accumulate greater snow depths, remnant woody cover, as well as waste grain, would be buried too deeply for pheasant-use in most years.

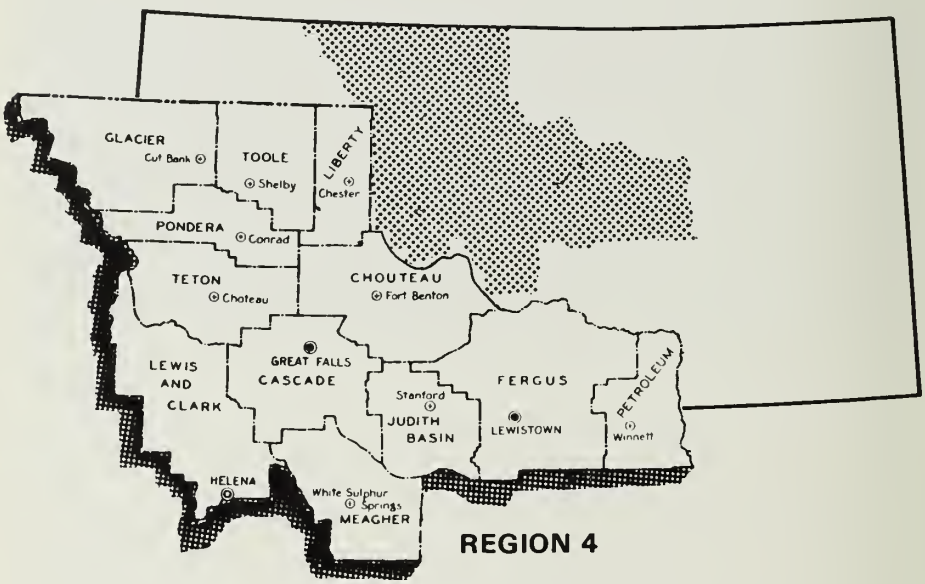
The dangers of alfalfa-harvesting to pheasants in the Bozeman-Trident area was recognized in 1941; proposals for releasing pheasants at eight sites were rejected by Department personnel partially because of hen mortality and nest destruction observed in alfalfa fields. The first cutting of alfalfa occurs June 21-30 in Broadwater, Jefferson and Madison Counties. Pheasants hatching prior to June 1 should survive the alfalfa-mowing season. Pheasants hatching after June 1 will suffer from the mowers. Beaverhead, Gallatin, Park and Silver Bow Counties usually do not experience first alfalfa cuttings until July 1. Pheasants should be able to survive alfalfa-mowing operations in all but late hatching years in these latter counties.

The dairy industry in the Gallatin Valley has focused attention on alfalfa as a forage crop. Part of assuring good alfalfa production has included attempts to control alfalfa-feeding insects. Chlordane was used to repeatedly treat the increasing thousands of acres of potential pheasant cover. Use of this and other pesticides certainly has had some effect on pheasants inhabiting treated areas (see Pesticides).

Intensively managed cattle-alfalfa operations have increased in former pheasant ranges in southwest Montana. Land which previously produced pheasants is now producing dairy products, beef and livestock forage. Continued releases of game farm pheasants have not bolstered sagging ringneck populations. Only major changes in land uses and agricultural practices will alleviate the poor pheasant situation in this region. Pheasant populations are low and may get even lower.

NORTHCENTRAL MONTANA

The northcentral Montana region encompasses 11½ counties. It includes some of Montana's best pheasant habitat as well as some "pheasant deserts". The better pheasant ranges are croplands along natural drainages which are not heavily grazed by livestock. The poorer ranges include several irrigation projects and those dryland farming areas away from stream-courses. The increase in mobile, sprinkler irrigating systems since 1970 may further alter the quality of many pheasant habitats in this region.



Pheasant Surveys

Due to the wide range of habitat conditions, pheasant populations are discussed in detail for individual areas. Regional trends in pheasant numbers, as indicated by population indices, have been downward during the past 20 years. More pheasants have been harvested in this than any other Montana region in 14 of the past 16 years; this is due largely to the region's larger size. Regional harvests peaked in 1966 and had declined 78 percent by 1972 (Table 28)! Cascade County has yielded the most pheasants per acre, to hunters, in 4 out of 7 years since 1967 (Table 29); during the other 3 years it ranked second in this region. Pondera County has been dropping as a top pheasant-yielder since 1970 while Fergus County has been gaining in the rankings.

An average of 13 percent of the bands from 18,842 banded game farm-reared pheasants released in the region during 18 years were returned by hunters (Table 30). The remaining 87 percent of these birds, provided by money from Montana hunters, served as food for predators and scavengers.

Table 28. **Annual pheasant harvests in northcentral Montana, 1958-73.**

Year	Pheasants Harvested	Percent of State Harvest
1958	74,848	32
1959	66,280	38
1960	49,515	32
1961	50,805	30
1962	51,960	27
1963	72,185	23
1964	98,096	27
1965	45,710	43
1966	110,830	50
1967	43,423	45
1968	41,131	43
1969	51,137	45
1970	40,660	42
1971	40,431	45
1972	24,869	37
1973	19,769	30
Average Harvest	55,103	—

Crop and Livestock Trends

Cropland acreages in this region experienced wide fluctuations from 1919 to 1934 (Fig. 20). Cropland almost doubled, however, between 1934 and 1950 (the all-time high acreage). There has been a gradual decrease from 1950 to 1970. Small grains, mostly winter and spring wheat and barley, averaged 99 percent of the total crops planted.

Alfalfa acreages increased five-fold between 1919 and the all-time peak in 1970 (Fig. 20).

Cattle numbers climbed from 1919 to 1935, then fell to a record low in 1940 (Fig. 20). Progressive increases in cattle have occurred during times of international conflict (World War II, the Korean Conflict and the Viet Nam War). The recorded high for cattle numbers (645,000) in this region occurred in 1970.

Fairfield Bench

One of the most popular pheasant hunting areas in this region, until the mid-1960's, was the Fairfield Bench (its location is described in Hen Harvesting). Irrigation water was first received on project farmlands in 1919; between 1927 and 1970, 60 to 83 percent of the Bench was irrigated.

Pheasants (60 game farm birds) were introduced on Fairfield Bench in 1936. Stocking small numbers (less than 100) of game farm birds continued each year until 1943 when 2,834 wild birds were transplanted here from the Milk River Valley. The Montana Fish and Game Commission authorized 6 pheasant refuges, totaling

Table 29. **County pheasant harvest-rankings in northcentral Montana, 1967-73.**

Year	1967	1968	1969	1970	1971	1972	1973
Regional Rank:							
1	Cascade	Cascase	Pondera	Pondera	Cascade	Cascade	Fergus
2	Pondera	Pondera	Cascade	Cascade	Fergus	Fergus	Cascade
3	Teton	Teton	Teton	Teton	Pondera	Teton	Judith Basin
4	Fergus	Fergus	Fergus	Fergus	Teton	Pondera	Petroleum
5	Judith Basin	Judith Basin	Chouteau	Judith Basin	Judith Basin	Judith Basin	Teton
6	Chouteau	Chouteau	Judith Basin	Chouteau	Chouteau	Chouteau	Pondera
7	Petroleum	Petroleum	Liberty	Petroleum	Liberty	Petroleum	Chouteau
8	Liberty	Toole	Toole	Liberty	Petroleum	Liberty	Meagher
9	Toole	Liberty	Petroleum	Meagher	Toole	Toole	Lewis & Clark
10	Lewis & Clark	Lewis & Clark	Lewis & Clark	Lewis & Clark	Lewis & Clark	Meagher	Toole
11	Meagher	Meagher	Glacier	Toole	Glacier	Glacier	Liberty
12	Glacier	Glacier	Meagher	Glacier	Meagher	Lewis & Clark	Glacier

Table 30. **Numbers of game farm pheasants released and bands returned by hunters in northcentral Montana, 1947-73.**

Year	No. Pheasants Released [A]	Bands Returned	
		No.[A]	%
1947	464	66	14
1948	767	216	28
1957	2,930	375	13
1958	1,000	82	8
1959	300	122	41
1960	1,100	216	20
1961	1,533	117	8
1963	1,230	134	11
1964	937	129	14
1965	1,714	247	14
1966	1,087	46	4
1967	630	164	26
1968	850	116	14
1969	700	114	16
1970	800	164	20
1971	800	154	19
1972	1,100	33	3
1973	900	19	2
Totals	18,842	2,514	13

[A] Cocks-only releases and returns used in calculation in all years except 1969 and 1971 when both sexes were eligible for harvesting.

160 acres, in 1946 to "protect" breeding stocks. In 1946 an additional 365 wild pheasants were transplanted here (also from the Milk River area) and game farm stocking resumed in 1947. Sportsmen-landowner problems were reported in 1947; most frequent complaints involved hunters damaging fences, shooting toward livestock and buildings, driving cars through fields and leaving broken bottles in fields (which reportedly cut tractor tires).

Abnormally wet spring weather in 1948 resulted in unusually lush vegetation conditions on the Bench.

Crowing count surveys on Fairfield Bench date back to 1947. The 27-year peak count was obtained in 1953 (59 crowing cocks) and the low count was recorded in 1972 (2 crowing cocks) (Fig. 21); a 97 percent decrease in crowing cocks occurred during this 21-year period! Summer roadside brood counts during 1956-70 also reflected a declining population while average brood sizes ranged almost independently of brood density (Fig. 22).

Numbers of hunters interviewed at Fairfield Bench check stations reached an early peak in 1949 (1,807 hunters) and then dropped to a low 145 hunters in 1957

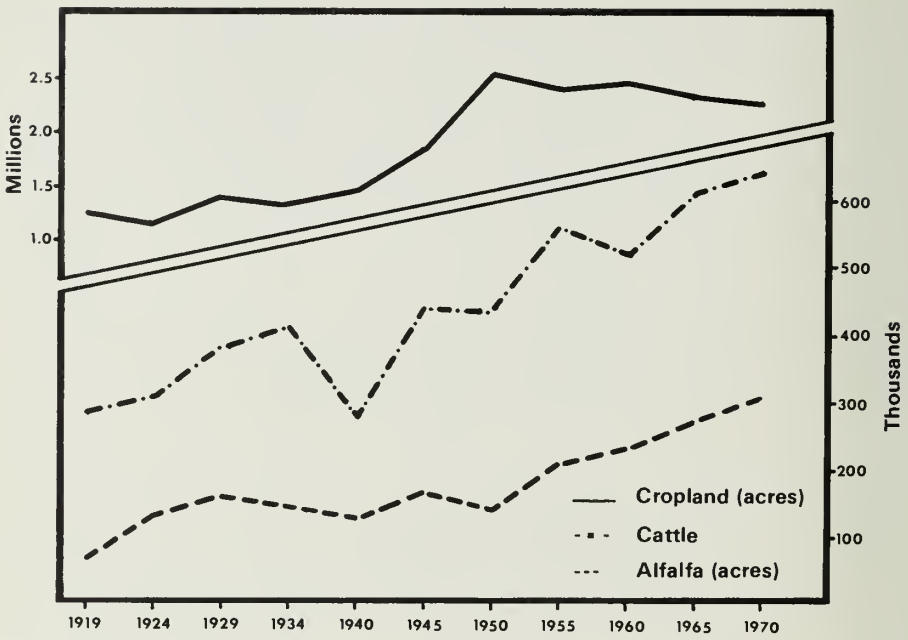


Figure 20. **Trends in grain crop and alfalfa acreages and cattle numbers in northcentral Montana, 1919-70.**

Once a highly productive pheasant area, Fairfield Bench now has much less cover due to intensive livestock grazing. *(Photo by J.P. Weigand)*

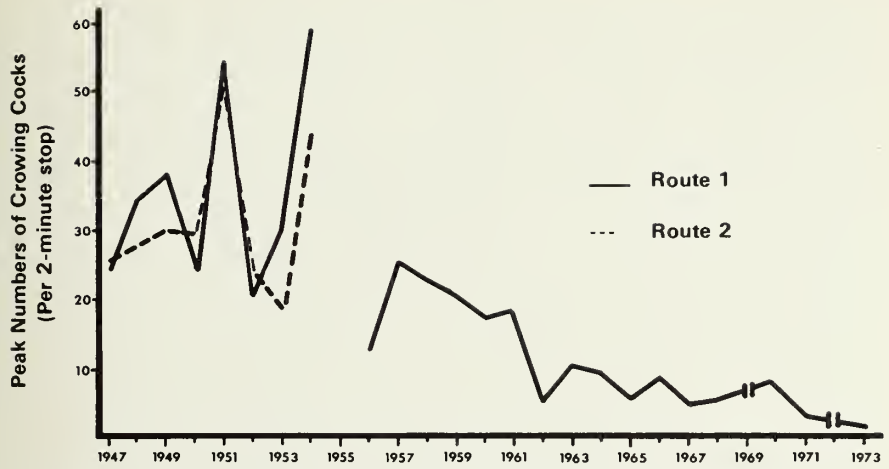


Figure 21. **Peak crowing cock counts on Fairfield Bench, 1947-73.**

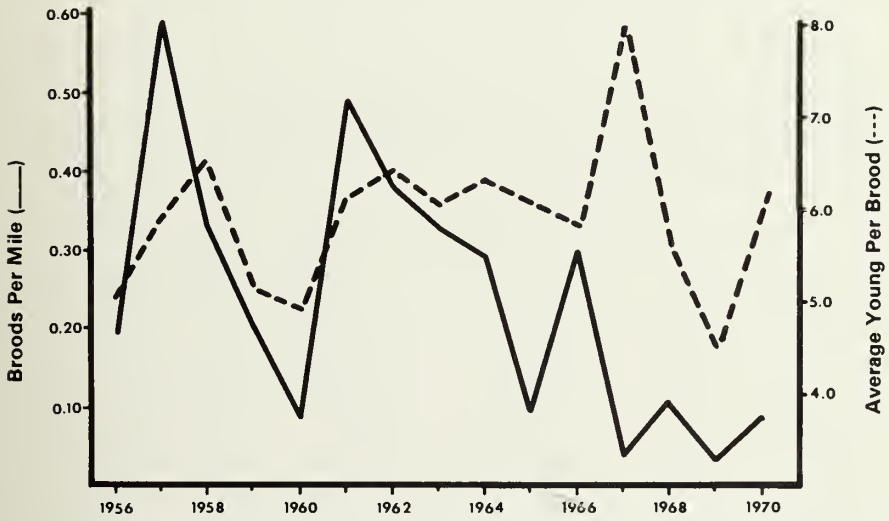


Figure 22. **Relative brood densities and average brood sizes along the Fairfield Bench Route, 1956-70.**

(Fig. 23). Another peak in hunter numbers occurred in 1959 when a pheasant hen was allowed in the daily bag. For the most part, however, numbers of hunters on the Bench has declined. Average hunting success for 23 years was 136 pheasants per 100 hunters and 3.3 hours per bagged bird (11 years only) on the Bench. Trends in pheasants harvested per 100 hunters are also presented in Figure 23. The proportion of juveniles in cocks harvested opening day or weekend ranged from 82 to 95 percent and averaged 92 percent during 1956-70 (Table 31); a highly productive population is indicated by these high percentages.

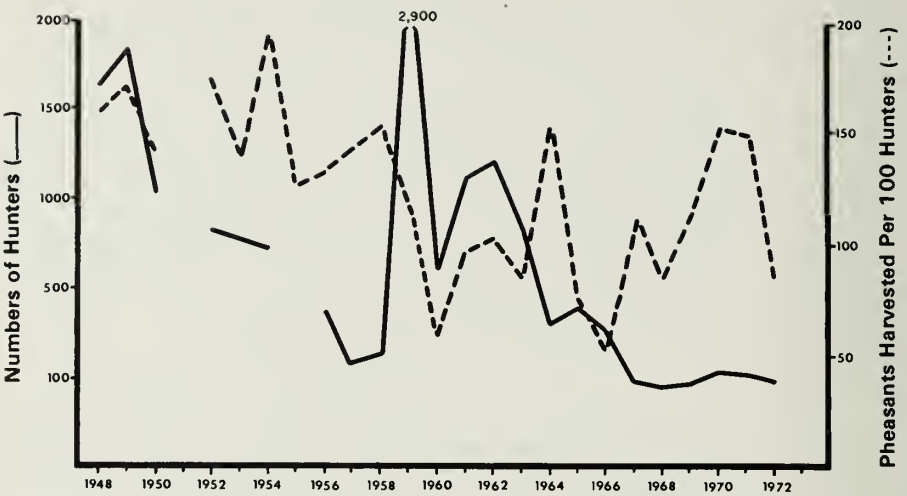


Figure 23. **Trends in numbers of hunters and in pheasants harvested per 100 hunters on opening day or weekend[A] on Fairfield Bench, 1948-72.**

Table 31. **Percent juveniles in cock harvests on opening day or weekend on Fairfield Bench 1956-70.**

Year	Numbers of Cocks Aged			Percent
	Adults	Juveniles	Total	Juveniles
1956	35	530	565	94
1957	31	367	398	92
1958	42	865	907	95
1959	221	1,765	1,986	89
1960	21	289	310	93
1961	48	593	641	93
1962	46	580	626	93
1963	52	525	577	91
1964	45	293	338	87
1965	24	315	339	93
1966	16	113	129	88
1967	6	33	39	85
1968	9	40	49	81
1970[A]	4	40	44	91
Totals	600	6,348	6,948	92 (Avg.)

[A] Freezout Game Management Area.

Winter surveys, 1947-72, revealed sex ratios ranged from 113 to 831 hens per 100 cocks, (Table 32). Thus, a surplus of cocks (surplus for breeding the following spring) remained after each hunting season. Sex ratios for the 16 winters averaged 505 hens per 100 cocks.

Land use records, maintained by irrigation project personnel, showed farm numbers on Fairfield Bench increased from 221 in 1925 to 800 in 1945 and then decreased to about 450 in 1970. Average farm size fluctuated in reverse fashion; in 1925, farms averaged 133 acres, about 90 acres in 1945 and 180 acres in 1970. The doubling of farm size, 1945-70, implied fewer but larger fields; fewer fields meant fewer field edges with pheasant cover. Reduced vegetative cover meant pheasants had to travel further in the open and this decreased their chances of survival.

Seed crops (including cereal grains, row crops and others like flax and millet) increased in total acreage until about 1950; after 1950, acreages declined almost as rapidly as they had risen (Fig. 24). Between 1950 and 1970 seed crop acreage dropped 19,900 acres (down 43 percent) while hay, mostly alfalfa, acreage increased 13,000 acres (up 220 percent) and pasture acreage increased 6,600 acres (up 170 percent). It appears that alfalfa and pasture increases represented almost exact acre-per-acre conversions from seed crops.

Table 32. **Winter sex ratios of pheasants on Fairfield Bench, 1956-71.**

Winter of:	Number of Pheasants Sexed			No. Hens Per 100 Cocks
	Cocks	Hens	Total	
1947-48	62	70	132	113
1949-50	81	431	512	532
1951-52	53	370	423	698
1956-57	256	1,640	1,896	641
1957-58	226	1,459	1,685	646
1958-59	355	1,987	2,342	560
1959-60	181	1,505	2,386	831
1961-62	178	752	930	422
1962-63	49	367	416	749
1963-64	83	313	396	377
1964-65	295	955	1,250	324
1965-66	185	920	1,105	497
1966-67	67	331	398	494
1967-68	137	454	591	331
1968-69	83	106	189	128
1971-72	27	51	76	189
Totals	2,318	11,711	14,029	505 (Avg.)

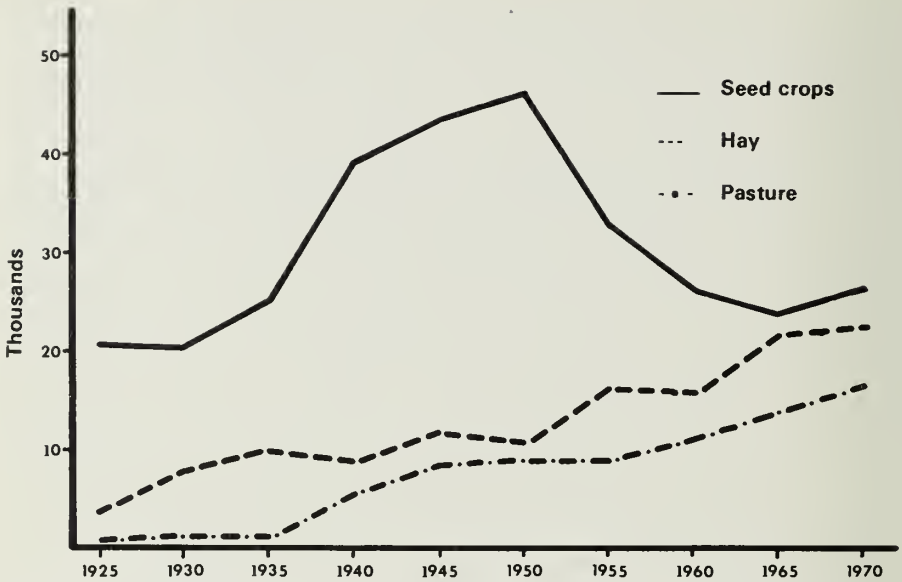


Figure 24. **Trends in crop, hay and pasture acreages on Fairfield Bench, 1925-70.**

Alfalfa cutting in this area begins each year about the last week in June. The peak of pheasant hatching occurs the second week in June and many pheasant chicks are just beginning to fly when alfalfa mowing begins. Some hens are still incubating eggs at this time and if they escape modern swathers, overall cover is reduced as they begin renesting. The increased alfalfa acreage since 1945 has increased the chances of pheasants encountering the swathers.

Livestock numbers increased from 2,411 cattle and 4,163 sheep in 1925 to 8,603 cattle and 20,453 sheep in 1945. Livestock record-keeping was terminated after 1950. Acreages of pasture almost doubled from 1950 to 1970 however, and it could be assumed that numbers of livestock increased noticeably, if not correspondingly. Low pasture acreage and livestock numbers during early project years resulted in grazing of few irrigation ditches and idle areas. Currently, the more intensive grazing of more acres of irrigated pasture has also resulted in grazing more of the project's irrigation ditches (ditches which used to provided pheasant cover).

Fairfield Bench farmers were encouraged to plant shelterbelts from 1930 through 1945 to improve the appearance of farm-sites. Popularity of this farm improvement was illustrated in the planting of 184 shelterbelts consisting of 65,000 trees during 1930-35. While project advisors and farmers were improving aesthetic values of the farms, they were coincidentally improving conditions for pheasants by planting protective winter cover. Shelterbelts apparently reached their highest pheasant-cover value 15-25 years after they were planted. With maturation of most shelterbelts by the early 1960's and the increased tendency to graze them with livestock, their cover value for ringnecks has dropped practically to "zero". Few new shelterbelts have been planted in recent years, and fewer of the old ones have been replaced.

The Fairfield Bench pheasant story could be entitled "Ringneck Rags to Riches, and Back to Rags Again". The area has experienced its pheasant "boom and bust" in less than 30 years. Pheasant abundance has corresponded with agricultural practices in the area. Currently this pheasant range is very poor and has a pheasant population to match it.

The Judith Basin

Another popular central Montana pheasant hunting area lies in the middle portion of the Judith River Basin, in Fergus and Judith Basin Counties. The area is characterized by diversified farms and ranches and is traversed by moderate to heavily wooded tributaries of the Judith River. The close proximity of grain fields to heavier cover contributes greatly to the pheasant value of the area. This area has absorbed much of the hunting pressure previously directed at western Montana pheasant ranges.

Crowing cock counts from 3 routes in the Judith Basin, 1954-73, indicate a general population decline (Fig. 25). The severest declines occurred during 1954-56 (an 81 percent drop in Hobson-Utica area) and 1961-62 (a 75 percent drop along McDonald Creek).

Summer population indices show pheasant production has fluctuated greatly between 1956 and 1970 in the Judith Basin (Fig. 26). In addition to these indices, relative brood density in the Denton area was 0.51 broods per mile in 1965, 1.09 in 1966 and then steadily decreased to 0.18 in 1970. Average brood sizes were 6.1 young in the Hobson-Utica area, 6.1 young along McDonald Creek, 5.7 young along Sage Creek and 6.4 young in the Denton area during respective survey periods.

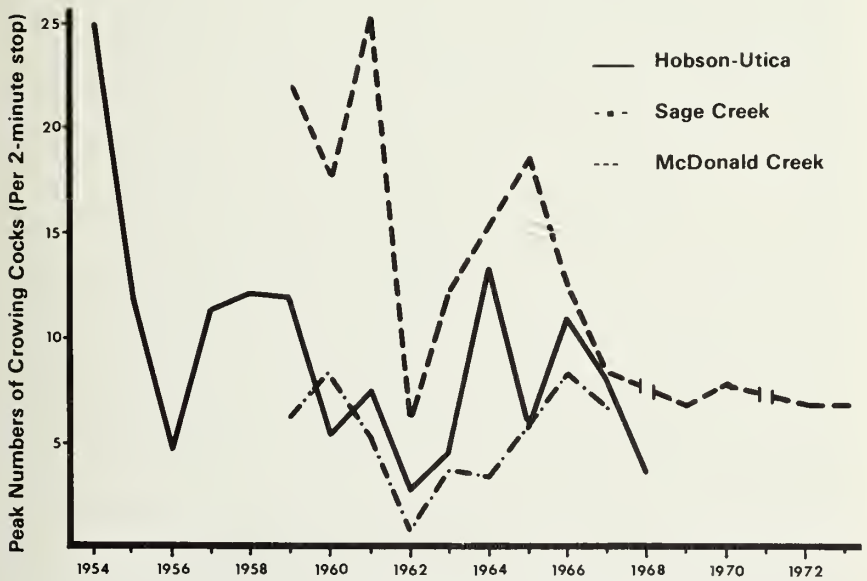
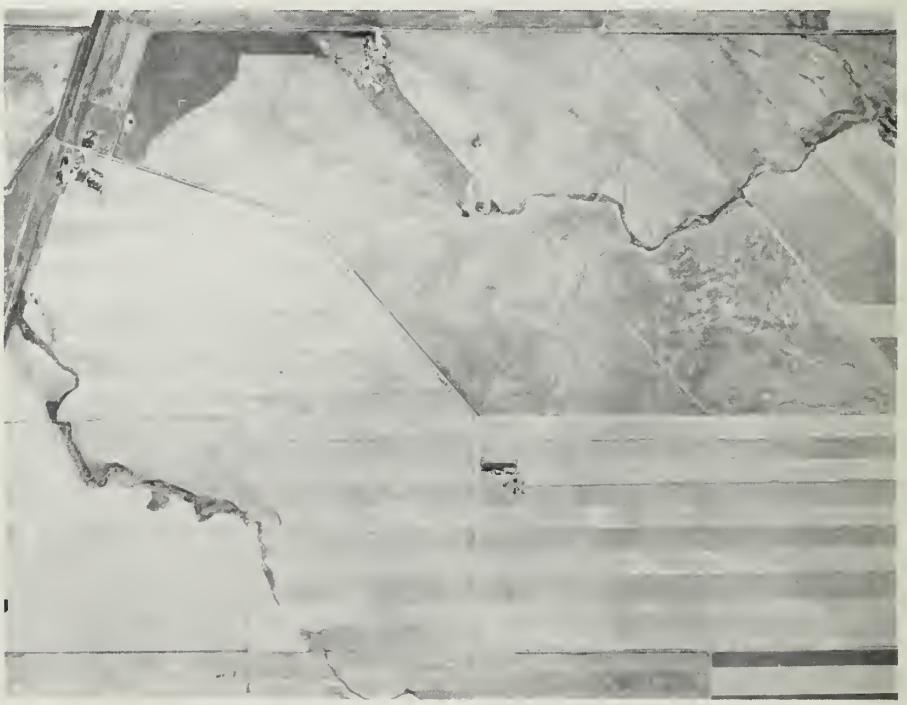


Figure 25. **Peak crowing cock counts in the Judith Basin, 1954-73.**

The change in kinds of crops, farming practices, and numbers of farms from 1936 (upper) to 1966 (lower) is vividly illustrated by aerial views taken east of Great Falls.
(U.S. Soil Conservation Photos)



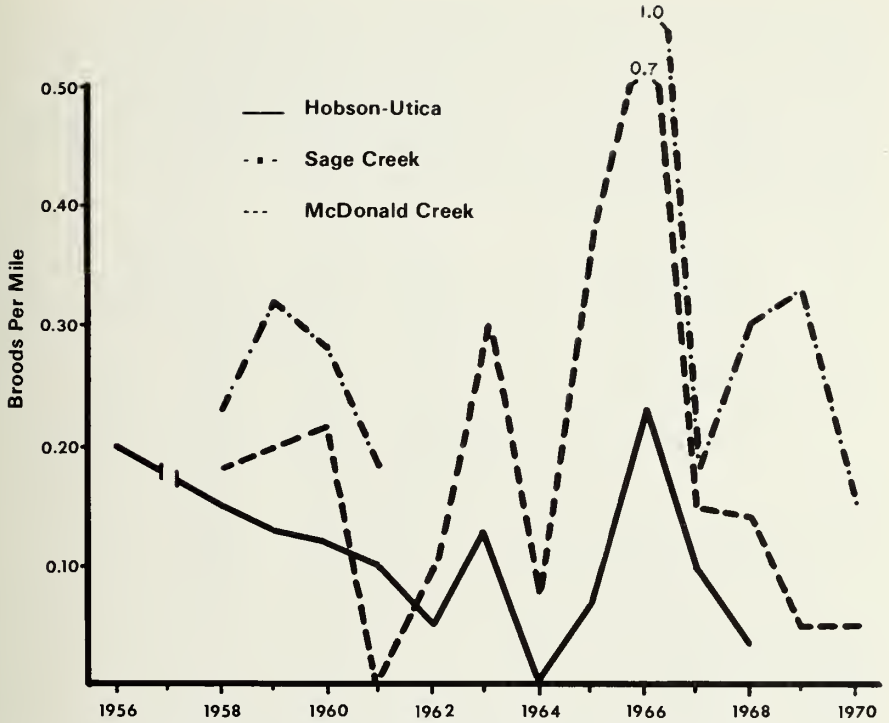


Figure 26. **Relative brood densities in the Judith Basin, 1956-70.**

Pheasant hunting success was measured in the Coffee Creek and Denton areas and northwest of Lewistown during 1966-72. Hunters averaged 141 pheasants per 100 hunters (low of 83 in 1968 and high of 165 in 1971) and 2.5 hours per bagged bird (low of 1.6 hours in 1967 and high of 3.5 hours in 1968). Proportions of juveniles in the opening day or weekend cock harvest ranged from 82 to 90 percent annually during 1966-70 and indicate a productive pheasant population for each year sampled.

Winter sex ratios ranged from 80 to 158 hens per 100 cocks during six winters (Table 33). Five of the six annual winter survey periods (1958-59 excepted) were preceded by hunting seasons permitting one hen in the daily bag; hen harvesting may have resulted in the nearly even sex ratios.

Agricultural records show cropland acreages (other than hay) first peaked about 1919 and again in 1945-50 in Fergus County; cropland decreased 23 percent between 1950 and 1970. Although alfalfa acreage increased 384 percent between 1919 and 1970, it comprised less than one-fourth of the total cropland-alfalfa acreage. Most alfalfa is grown on floodplains and is not artificially irrigated. Cattle numbers increased 280 percent from their 50-year low in 1940 to peak numbers in 1970.

In Judith Basin County cropland acreage peaked in 1945 and had decreased 35 percent by 1970. Alfalfa acreage increased 267 percent between 1934 and 1970; it comprised less than one-fourth of the total cropland-alfalfa acreage in 1970. Cattle numbers increased 246 percent between the 50-year low in 1940 and 1970-peak

Table 33. **Winter sex ratios of pheasants in the Judith Basin.**

Winter of:	Area	Number of Birds Sexed			Hens Per 100 Cocks
		Cocks	Hens	Total	
1958-59	Windham-Utica	35	28	63	80
1965-66	Denton	286	391	677	137
	McDonald Cr.	264	303	567	115
	Totals	550	694	1,244	126 (Avg.)
1966-67	Denton	101	110	211	109
	McDonald Cr.	95	128	223	135
	Sage Cr.	150	304	454	203
	Totals	346	542	888	157 (Avg.)
1969-70	Fergus Co.	203	239	442	118
	Judith Basin Co.	68	90	158	132
	Totals	271	329	600	121 (Avg.)
1970-71	Fergus Co.	54	86	140	158 (Avg.)
1971-72	Fergus Co.	170	192	362	113 (Avg.)

numbers. Numbers of sheep have declined gradually from 1940 to 1970 but their grazing pressure was more than compensated for by increases in cattle numbers.

Pheasant populations in the Judith Basin currently exhibit poor spring numbers, good production and a surplus of cocks each winter. While habitat is fair by current Montana standards, it is deteriorating. Noticeable amounts of cropland have been lost; in bottomlands much of the cropland was converted to alfalfa-growing. The effect of increasing cattle numbers is noted in increased grazing of floodplains adjacent to and within pheasant winter cover. Future pheasant abundance will reflect habitat trends of the area; at present they appear to have stabilized at a fairly low level. More intensive grazing of wooded areas, removal of woody cover by chemical or mechanical means and continued loss of cropland would render this area into another mediocre pheasant range.

The Grain Triangle

This vast northcentral Montana area, with Great Falls, Havre and Cutbank as apexes, includes a significant part of Montana's wheat and barley acreage. Some of Montana's previously better pheasant hunting was found along the wooded streamcourses intercepting these farmlands. In January, 1947 a complaint involving pheasant damage to shocked wheat was filed by a Conrad-area farmer. Field inspection by a Department biologist revealed the field, in which the damge occurred, bordered an irrigation ditch with a heavy growth of willows, sweet clover and "weeds". Complaints 25 years later from this area involve pheasant scarcity,

not pheasant abundance; irrigation ditches are heavily grazed and little vegetation cover for pheasant concealment is available.

Pheasant surveys in the Triangle have centered mainly in Pondera and Teton Counties. Crowing cock counts declined 91 percent, 1949-73, in the Conrad area and decreased 88 percent, 1961-73 in the Agawam-Farmington area (Fig. 27).

Relative brood densities in the Triangle fluctuated quite violently during 1956-

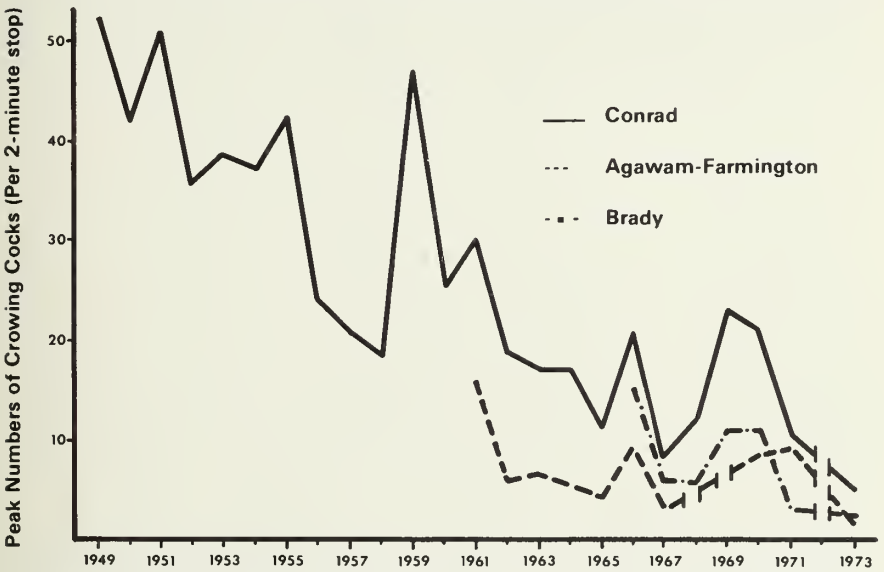


Figure 27. **Peak crowing cock counts in The Grain Triangle, 1949-73.**

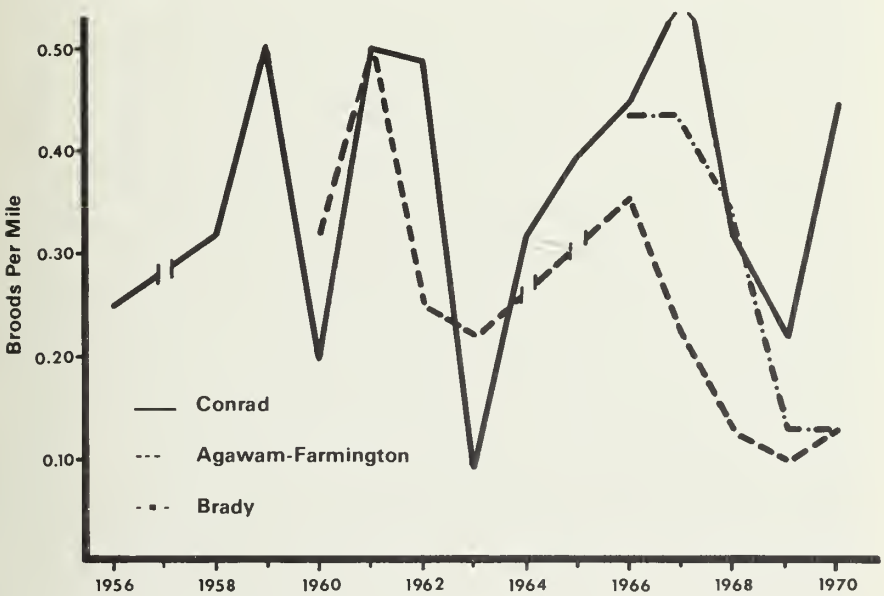


Figure 28. **Relative brood densities in The Grain Triangle, 1956-70.**

70 (Fig. 28). Broods averaged 5.5 young in the Agawam-Farmington area (1960-70), 5.8 young near Brady (1966-70) and 5.9 young east of Conrad (1956-70).

Check stations have been maintained opening day or weekend of pheasant season in the Triangle since 1948. The main station has been operated near Conrad while stations at Brady and Valier have had briefer histories. Hunter interviews at the Conrad station dropped from 529 in 1949 to 211 in 1950, fluctuated between 86 and 320 hunters during 1959-1966, and then began a gradual decline to only 51 hunters in 1971 (Fig. 29). Pheasants harvested per 100 hunters ranged from 92 to 222 and averaged 156 during 1948-71. An average of 2.4 hours was required to bag

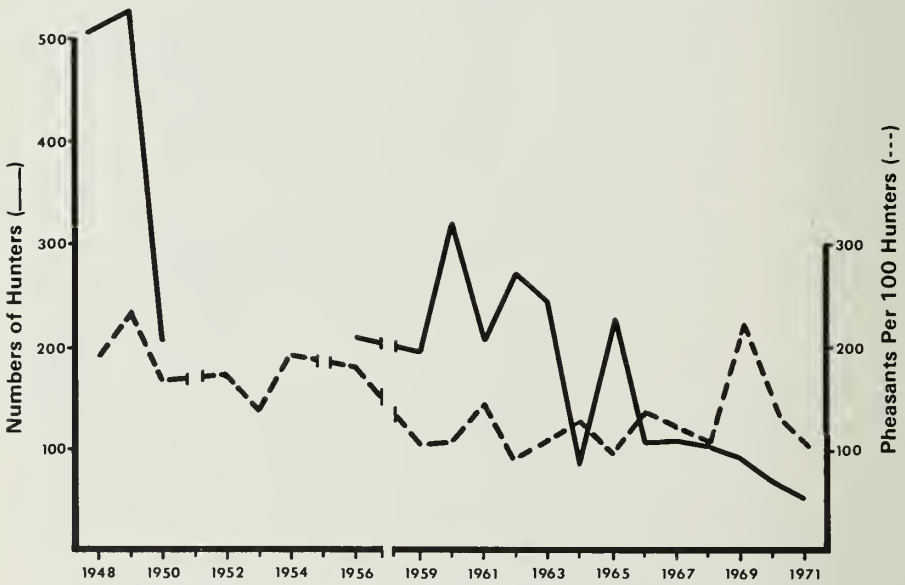


Figure 29. **Trends in numbers of hunters and in pheasants harvested per 100 hunters near Conrad, 1946-71.**

each pheasant. Juveniles ranged from 79 to 91 percent, and averaged 87 percent, of the pheasant cocks harvested opening day or weekend (Table 34) and suggested a productive pheasant population.

Winter sex ratios in The Grain Triangle, and principally from the Conrad area, ranged from 110 to 809 hens per 100 cocks (Table 35). They indicated surplus numbers of cocks following each hunting season and adequate breeding stock ratios for each succeeding spring.

Cropland acreage in Pondera County increased from 129,600 acres in 1919 to 299,800 acres in 1950; since 1950 cropland decreased 14 percent. Alfalfa acreage ranged between 4,300 and 14,600 acres during 1919-70; the peak acreage occurred in 1970 and increased 321 percent, 1950-70. Cattle numbers reached an all-time peak of 38,000 in 1934, declined to 14,000 by 1940 and then steadily increased back to 35,000 by 1970.

The large cropland acreage no doubt benefitted pheasant populations in Pondera County; food could scarcely be classed as a limiting factor on pheasants.

Table 34. **Percent juveniles in cock harvests on opening day or weekend in the Conrad area, 1959-70.**

Year	Numbers of Cocks Aged			Percent
	Adults	Juveniles	Total	Juveniles
1959	32	120	152	79
1960	30	295	325	91
1961	39	258	297	87
1962	21	209	230	91
1963	40	211	251	84
1964	13	90	103	87
1965	21	172	193	89
1966	19	107	126	85
1967	13	106	119	89
1968	19	105	124	85
1969	16	88	104	85
1970	6	44	50	88
Totals	269	1,805	2,074	87 (Avg.)

Thousands of acres of food but no winter cover makes much of the "Grain Triangle" a pheasant-desert. *(Photo by J.P. Weigand)*

Table 35. **Winter sex ratios of pheasants in The Grain Triangle, 1947-72.**

Winter of:	Area	Number of Birds Sexed			Hens Per 100 Cocks
		Cocks	Hens	Total	
1947-48	Conrad	132	255	387	193
1949-50	Conrad	71	389	460	548
1958-59	Conrad	75	249	324	332
1959-60	Conrad	66	370	436	561
1961-62	Conrad	181	1,009	1,190	557
1962-63	Conrad	34	275	309	809
1963-64	Conrad	140	330	470	236
1964-65	Conrad	35	67	102	191
1965-66	Conrad	261	735	996	282
1966-67	Conrad	20	92	112	460
1967-68	Conrad	168	760	928	452
1968-69	Agawam	249	455	749	189
	Choteau	43	173	216	402
	Conrad	240	641	881	267
1969-70	Agawam	492	540	1,032	110
	Conrad	180	701	881	389
1971-72	Agawam	159	262	421	165

Increasing farm sizes, field enlargement with removal of border cover and increasing popularity of pesticide-use on these croplands may, however, have had cumulating adverse effects on pheasant populations. The low acreage of alfalfa minimizes danger to nesting hens and broods during hay harvests. The recent 20-year trend toward more cattle may be reducing amounts of agriculturally idle and high quality woody cover available to pheasants.

In Teton County, croplands attained their highest acreages by 1950 and were more or less retained through 1970; acreages ranged between 238,500 and 265,500 during the period with the 50-year high acreage occurring in 1960. Alfalfa acreage increased 35 percent between 1950 and 1970; the all-time high of 32,600 acres occurred in 1970. Cattle numbers reached an early peak of 56,000 in 1934, decreased to 27,300 by 1940 and had increased to 57,200 by 1965; in 1970 there were 56,000 cattle.

Increasing grain acreages, low alfalfa acreages and low cattle numbers during the 1940's undoubtedly contributed to increases in Teton County pheasant numbers. While cropland is still abundant, alfalfa acreage and cattle numbers have increased apparently to a point affecting pheasant abundance. Conversions of

irrigated grain to alfalfa, increased numbers of cattle grazing idle areas in grain and alfalfa fields, and more cattle browsing the limited woody cover have apparently depressed pheasant populations. Removal of broad-leaved vegetation along irrigation ditches by herbicide-use and the growth of grasses which are then grazed by livestock have deprived pheasants of necessary nesting, brood and escape cover.

Dryland portions of The Triangle have not naturally evolved significant amounts of tall, dense woody cover; rose bushes, snowberry and big sagebrush provided low shrubby cover. Establishing shelterbelts around farm and ranch sites initially increased winter cover for an expanding pheasant population. Many shelterbelts still survive; many are grazed by livestock. They could support more pheasants during the winter if nesting cover were still available for pheasant production.

Other Areas

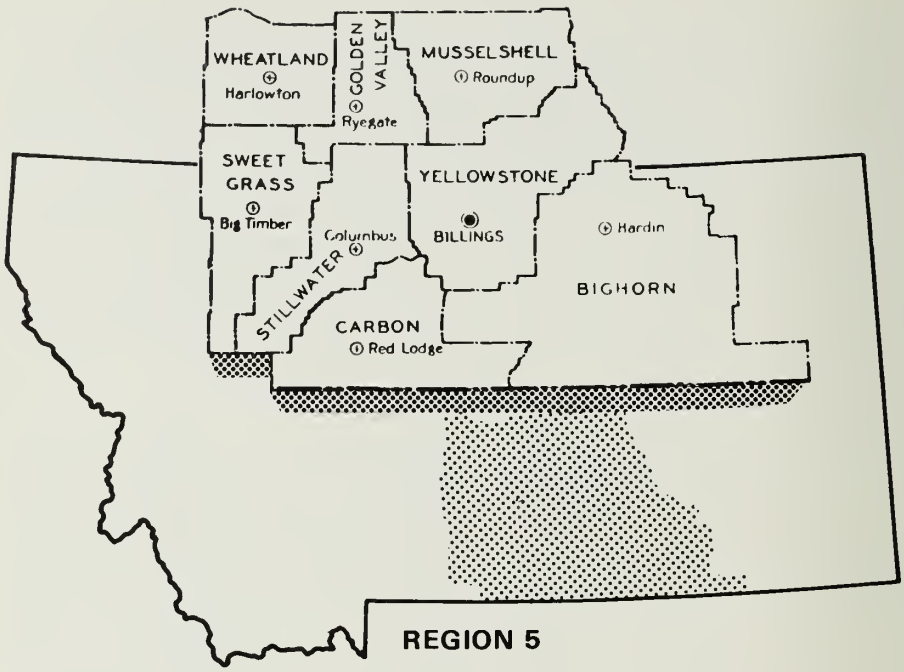
The Helena Valley, which was considered good pheasant hunting by local hunters through the early 1950's, has passed from the limelight too. Crowing cock surveys were conducted in the Valley between 1948 and 1965. A peak count of 15 calls per 2-minute stop was recorded in 1949; a low count of 1 call was recorded in 1958. The resulting 93 percent decrease occurred in just 10 years! Summer surveys conducted during 1964 and 1965 yielded only occasional brood sightings. In 1966 no broods were recorded and surveys were terminated. The progressing cattle-alfalfa complex, coupled with urban expansion and popular horse-raising, has dealt pheasant habitat a severe blow. Pheasants can still be found along the edges of the Valley where grain crops are closely associated with woody cover. Local sportsmen feel that release of game-farm pheasants is the answer to the problem of Helena Valley pheasant shortages. If wild birds are unable to survive in this pheasant desert, how can one realistically expect pen-raised birds to do so?

Meagher County is largely mountainous. The lower valleys near White Sulphur Springs formerly supported large populations of sage grouse. Transforming sagebrush lands into cultivated fields might be expected to result in good pheasant habitat. However, cattle and sheep grazing pressure on remaining vegetation has upset any cover-food balance required by pheasants. As more sagebrush yields to mechanical and chemical destruction, the sage grouse (and antelope too) will retreat, and the pheasant will be unable to fill this game-bird void.

Currently some of Montana's best pheasant range is found in Cascade and Fergus Counties. Portions of Chouteau, Judith Basin, Pondera and Teton Counties contain some good pheasant habitat but most is rated only fair. Glacier, Lewis and Clark, Liberty, Meagher, Petroleum and Toole Counties support poor pheasant numbers.

SOUTHCENTRAL MONTANA

Major pheasant ranges in southcentral Montana include the irrigated Yellowstone and Bighorn River floodplains, their tributaries and the Musselshell River Valley. Less popular pheasant hunting areas, though fair pheasant producing areas, occur on dryland farms. This region contains Montana's heaviest human-populated county (Yellowstone) and largest city (Billings).



Pheasant Surveys

Long-term pheasant population indices in this region have been limited to hunting success and harvest information. In the Yellowstone Valley, east of Billings, numbers of hunters interviewed decreased 96 percent between 1958 and 1972 (Fig. 30). Peak hunting success was recorded in 1963 while the lowest success

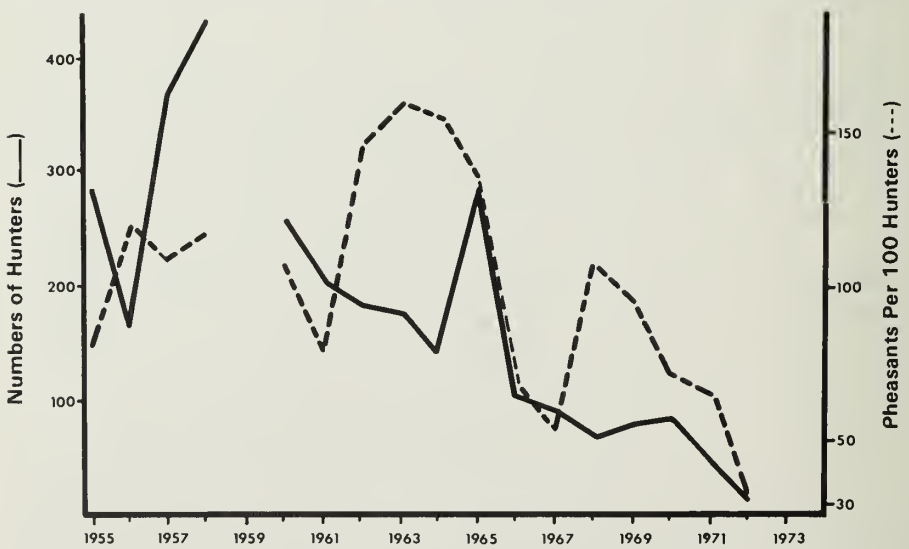


Figure 30. **Trends in numbers of hunters and in pheasants harvested per 100 hunters near Billings, 1955-72.**

was noted in 1972; pheasants per 100 hunters decreased 81 percent during this 10-year period. During the 17 years this check station was operated, hunters averaged 1 12 pheasants per 100 hunters. This average hunting success was exceeded during 2 of the 6 years (33 percent) cocks-only harvests were allowed and 5 of the 11 years (45 percent) hen harvesting was permitted. When hunters were allowed 1 hen in the 3-bird daily bag (1962-65 and 1967-70), an average 32 percent of the pheasants harvested on opening day or weekend were hens. In 1965-66 when either-sex 3-bird daily limits were in effect, hens again averaged 32 percent of the pheasants harvested. Hunters averaged 3.6 hours afield for each bird bagged during the opening day or weekend.

At the Hardin check station, numbers of interviewed hunters increased between 1965 and 1970 and then decreased through 1972 (Fig. 31). Hunting

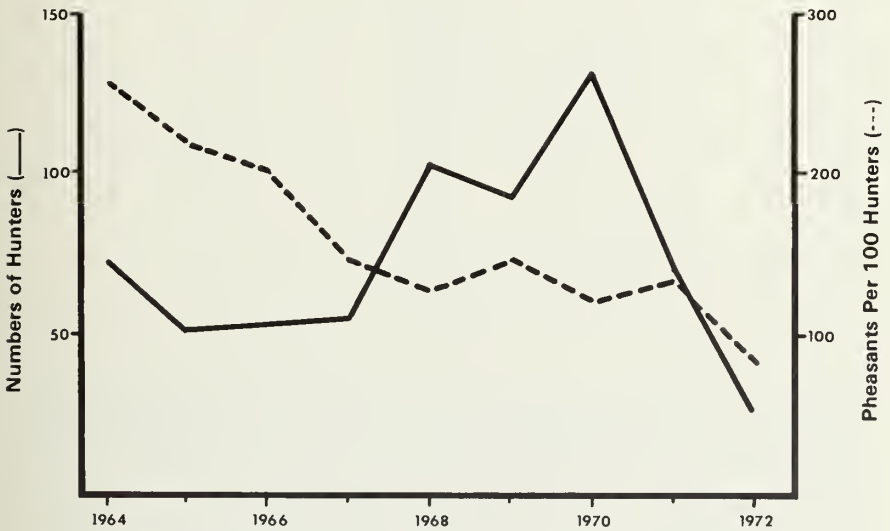


Figure 31. **Trends in numbers of hunters and in pheasants harvested per 100 hunters near Hardin, 1964-72.**

success, however, showed a decreasing trend during 1964-72. Hens averaged 28 percent of the pheasants examined opening day or weekend (1967-72) when 1 hen was allowed in the 3-bird daily bag. They averaged 27 percent of the pheasants examined (1964-66) when either-sex 3-bird daily limits were in effect. Hunters averaged 2.4 hours afield for each pheasant bagged opening day or weekend, 1964-72.

A total of 3,644 banded game farm pheasants were released in this region in 1957, 1960 and 1961. Hunters returned 483 bands or 13 percent of the total birds released.

Regional pheasant harvests declined 37 percent between 1958 and 1960, increased 242 percent between 1960 and 1964, and then began an overall decreasing trend which continued through 1973 (Table 36). The top pheasant harvest-per-acre county in southcentral Montana, 1967-73, was Yellowstone County (Table 37).

Table 36. **Annual pheasant harvests in southcentral Montana, 1958-73.**

Year	Pheasants Harvested	Percent of State Harvest
1958	43,430	19
1959	28,506	16
1960	27,351	17
1961	28,451	17
1962	38,447	20
1963	61,032	20
1964	66,233	19
1965	28,820	27
1966	44,550	20
1967	14,463	15
1968	16,129	17
1969	17,413	15
1970	12,746	13
1971	10,511	12
1972	10,424	15
1973	6,303	10
Average Harvest	28,426	—

Corn harvested for silage leaves nothing for pheasants but short stubble and bare earth in the Yellowstone River Valley. *(Photo by J.P. Weigand)*

Table 37. **County pheasant harvest-rankings in southcentral Montana, 1967-73.**

Year	1967	1968	1969	1970	1971	1972	1973
Regional Rank:							
1	Yellowstone	Yellowstone	Yellowstone	Yellowstone	Yellowstone	Yellowstone	Yellowstone
2	Carbon	Big Horn	Carbon	Carbon	Carbon	Big Horn	Carbon
3	Big Horn	Carbon	Big Horn	Big Horn	Golden Valley	Carbon	Big Horn
4	Stillwater	Stillwater	Stillwater	Stillwater	Stillwater	Stillwater	Golden Valley
5	Wheatland	Wheatland	Golden Valley	Musselshell	Big Horn	Golden Valley	Stillwater
6	Golden Valley	Musselshell	Musselshell	Golden Valley	Musselshell	Musselshell	Sweetgrass
7	Musselshell	Sweetgrass	Wheatland	Sweetgrass	Sweetgrass	Sweetgrass	Musselshell
8	Sweetgrass	Golden Valley	Sweetgrass	Wheatland	Wheatland	Wheatland	Wheatland

Crop and Livestock Trends

Peaks in southcentral Montana cropland acreages were noted in 1919 and 1950 (Fig. 32). Cropland acreages decreased 16 percent between their 1950-peak and 1970. While acreages of small grains (barley, oats, rye, wheat and flax) have progressively decreased, row crop acreages (corn, beans, potatoes and sugar beets) have increased. Row crops increased in proportion of total cropland from 8 to 12 percent during 1950-70. A 134 percent increase in corn acreage, 1950-70, and increased proportions of corn acreage cut for silage, 1960-70, reflect increased cattle-feeding activity (mostly in the Bighorn and Yellowstone Valleys).

Alfalfa acreage doubled from 1919 to 1945 and then fluctuated between 170,600 and 200,800 acres during 1945-70 (Fig. 32).

Cattle numbers increased from 182,900 in 1924 to 532,000 in 1970 (Fig. 32); a 168 percent increase in cattle numbers was noted between 1950 and 1970! Although many cattle were probably added to dry rangelands, much of the increase in cattle numbers is believed due to increasing numbers of feedlots in the Yellowstone Valley.

Pheasant Population and Habitat Evaluations

The pheasant population explosion in the early-1940's was readily witnessed by many southcentral Montana residents. A special, either-sex (10 birds per day) pheasant season was opened September 26, 1942. Biologists on a check station east of Billings examined 1,500 pheasants during 5 hours on opening afternoon; approximately half of the birds were hens. Only a fraction of the hunters were interviewed at the check station. Fearing an overharvest of pheasants if this season continued, the biologists recommended and the Commission approved closure of this season; the special season lasted for a 2-week period. The regular 4-week season was held in 1942, beginning November 1, with daily bag limits of 3 cocks and 1 hen.

Winter, 1942 surveys revealed 4 hens per cock were still present in the Yellowstone Valley; this represented a reduction of only 1 hen-unit from previous sex

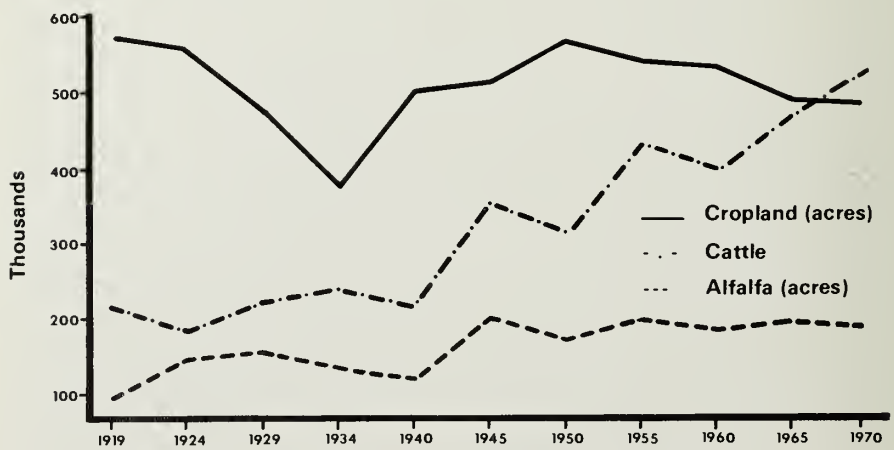


Figure 32. **Trends in grain crop and alfalfa acreages and cattle numbers in southcentral Montana, 1919-70.**

ratios. It was estimated that the liberal regulations resulted in an overall reduction of only 24 percent in the pheasant population!

The winter of 1942-43 was quite severe in southcentral Montana. Heavy spring runoff followed in 1943 and much of the available nesting habitat was flooded.

Late summer surveys in the Billings area indicated an 80 percent decrease in relative pheasant density between 1943 and 1947, a rebounding population during 1947-48 and another population decrease during 1951-53 (Table 38).

Table 38. **Late summer relative pheasant densities in the Yellowstone and Big Horn River Valleys, 1943-53.**

Year	No. Pheasants Observed Per Mile of Survey Route	
	Billings Area	Hardin Area
1943	5.1	6.0
1946	3.4	5.3
1947	1.0	4.4
1948	3.0	3.3
1951	3.3	1.9
1952	2.2	2.3
1953	1.7	—

Pheasants were apparently more numerous in the Hardin area than near Billings in 1943 (Table 38). In July, 1947, two Hardin-area farmers complained about pheasants damaging crops. They stated they would resort to poisoning pheasants if population densities increased any further! Between 1947 and 1948 pheasant densities decreased (naturally) by 25 percent. Relative pheasant densities decreased 68 percent between 1943 and 1951 near Hardin.

During the 1930's, when pheasant numbers were building in this region, over 97 percent of the cropland was planted to grains, a valuable pheasant food source. By 1940, grain fields had dropped to 88 percent of cropland acreage.

Southcentral Montana contains some of the state's earliest alfalfa cutting dates; in Big Horn and Yellowstone Counties first cuttings begin by June 10. In Big Horn County, approximately 37 percent of the pheasant chicks hatch during the 2 weeks immediately prior to alfalfa cutting and an additional 20 percent hatch during the first week of cutting. About 45 percent of Yellowstone County's pheasant chicks hatch during the 2 weeks preceding alfalfa cutting; an additional 11 percent hatch during the week of first cuttings. Thus, over one-half of the pheasant chicks hatching in alfalfa fields in these counties, in an average year, may be adversely affected by alfalfa mowers. Hens nesting and egg clutches in alfalfa fields at cutting time may be similarly, detrimentally, affected. Alfalfa in Musselshell and Stillwater Counties experience first cuttings about June 11-20; this is still early enough to kill many flightless chicks and late-nesting hens. In Sweetgrass County alfalfa cutting

begins during June 21-30 and in Carbon County, after June 30. Pheasant production in Carbon County would be least affected by mowing in the region's alfalfa fields.

Until 1970, a major cash crop in the Hardin area was sugar beets. Except for late summer brood cover, this crop provides little for ringnecks. The land is typically cultivated "cleanly" before seeding, weeded intensively during early summer, and contains rotting beet tops during the fall and winter. Pheasants, nonetheless, maintained low populations in these areas where irrigation ditches and stream courses were allowed to produce rank vegetation. Where corn or other cereal grains replaced beets, these important sources of food permitted more dense pheasant populations.

In 1970 the sugar beet processing plant in Hardin ceased operation. As a result, acreages previously planted to sugar beets were then planted to feed grains; feed grain acreages increased from 31 percent of area crops in 1970 to 56 percent in 1973. Numbers of feedlots began increasing in the area as increased amounts of feed grains became available. Unfortunately for pheasants, corn (the primary feed grain) stubble is plowed under each fall if possible.

In recent years pheasants in the Hardin area are facing a new threat. Extensive volunteering by Russian olive into farmlands has promoted the use of federal funds funds for its removal. Not too many years ago Russian olive was planted for wildlife food and cover. It is ironic that the same agencies promoting these plantings are now attempting to eradicate them.

Significant changes in land use east and west of Billings in the Yellowstone Valley have been noted between 1940 and 1972. Aerial photographs of these areas showed there were more fields and smaller fields in 1940 than in 1972. In 1940,field corners had rounded edges (with idle corners) and there were many "waste" areas between fields and near roads. In 1972 these "waste" areas were much scarcer.

Residential areas, industrialization and highway construction was much more widespread in 1972 than in 1940. Field investigations near Billings indicated the amount of land development for non-agricultural purposes had doubled between 1971 and 1974. Continued urbanization, industrialization, and highway building is claiming acreage which formerly housed pheasants. Loss of pheasant habitat to an expanding human population may seem insignificant, but the area has already lost most of its confined ringneck range to a cattle-oriented economy.

The Huntley Irrigation Project exhibits all the symptoms of previously described cattle-alfalfa areas. Further inroads on remaining pheasant cover by removing fencelines and cultivation to road edges are currently in evidence. Burning along railroad rights-of-way and ditchbanks continues to reduce pheasant cover. Over 3/4 of the farm land is fall-plowed, thereby erasing possible sources of winter food for pheasants.

In the Shepherd area, the pheasants' problems are further compounded by the addition of feedlots to the cattle-alfalfa complex. The major food source (corn) for pheasants is harvested for silage and the stubble is plowed under in the fall. The major cash crop, sugar beets, provides few of the pheasants' requirements. Patches of cattails are frequently burned, further subtracting from the sparse cover.

Good woody cover (in the form of buffaloberry, rose, big sagebrush, and willow) exists along Pryor Creek. Wheat fields adjacent to this cover provides readily available winter food *if the stubble is not fallowed in the fall.* Grain fields

Heavy undergrowth along parts of Yellowstone River is adequate for pheasants but adjacent grain fields occur infrequently. *(Photo by J.P. Weigand)*

Even fencelines and borrow pits are being erased under intensive farming practices on the Huntley Irrigation Project. *(Photo by J.P. Weigand)*

located some distance from the creek provide little for pheasants due to the long distances from protective cover. The flood plain along this drainage is quite narrow and the overall acreage of pheasant range is small.

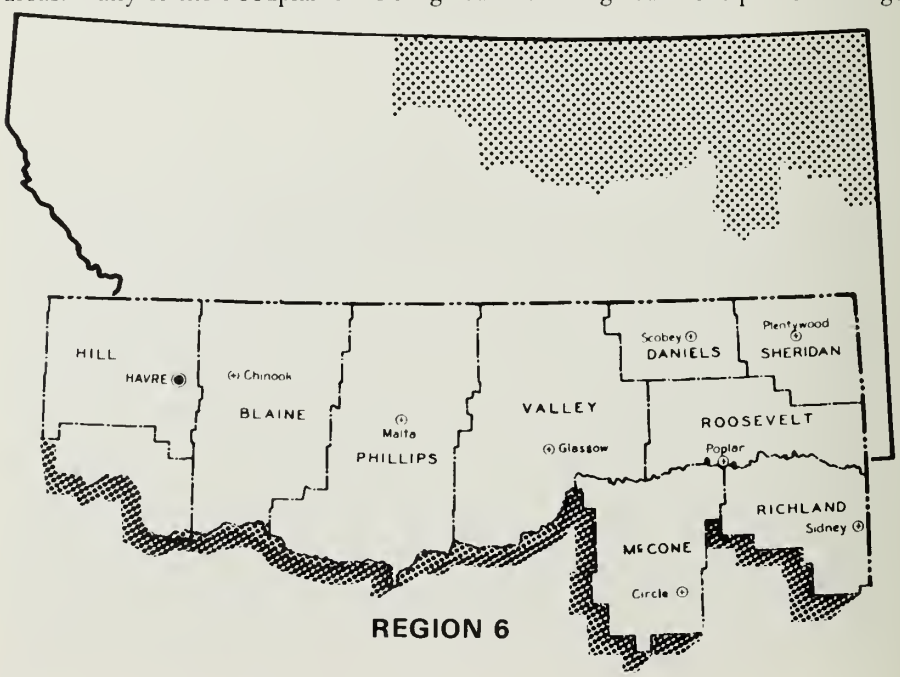
Mild winters along the Clarks Fork of the Yellowstone River is favorable for pheasants. However, the cattle-alfalfa complex has moved into this drainage and the remaining grain fields are on adjoining benchlands, too distant to be of much benefit to pheasants. During the Spring, 1968 an inspection of the area revealed cultivation or grazing of orchards (potential woody cover). Considerable burning along railroad rights-of-way (remaining nesting cover) was noted in the valley.

Pheasant range in the Yellowstone Valley west of Columbus is considered marginal. Marginal ringneck habitat also exists along the Musselshell River west of Harlowton. The lower Musselshell Valley, on the other hand, contains good winter cover but little grain. This latter area has shown fair pheasant production but is subject to spring flooding. Floods like those of 1967 can noticeably reduce pheasant numbers by inundating nests and by leveling cover.

The expanding cattle (and associated feed grain) industry will be increasingly detrimental to southcentral Montana pheasant populations. Pheasants in areas away from this intensive land use may maintain their population levels. Unless there is a major change in farming and ranching economics with corresponding changes in land use, pheasant populations will probably continue at, or decrease from, present levels.

NORTHEAST MONTANA

Major pheasant ranges in northeast Montana include floodplains of the Milk and Missouri Rivers, their tributaries and portions of extensive dryland farming areas. Many of the floodplains are irrigated or subirrigated. Little pheasant range



exists along the Missouri River above Fort Peck Reservoir due to the rough terrain which borders much of the river.

Pheasant Surveys

Long-term declines in pheasant numbers in northeast Montana began during the mid-1950's. Peak crowing cock counts in the Glasgow area dropped 89 percent between 1956 and 1965, in the Malta area they decreased 94 percent between 1956 and 1970, and near Sidney they decreased 95 percent between 1954 and 1970 (Fig. 33). Crowing counts in other areas declined in similar magnitudes: there was a 95 percent drop between 1959 and 1968 near Chinook and a 98 percent decline between 1963 and 1968 near Plentywood. Most pheasant populations suffered heavy losses during the winter of 1964-65 as evidenced by spring censuses. Spring populations have recovered only slightly since that winter.

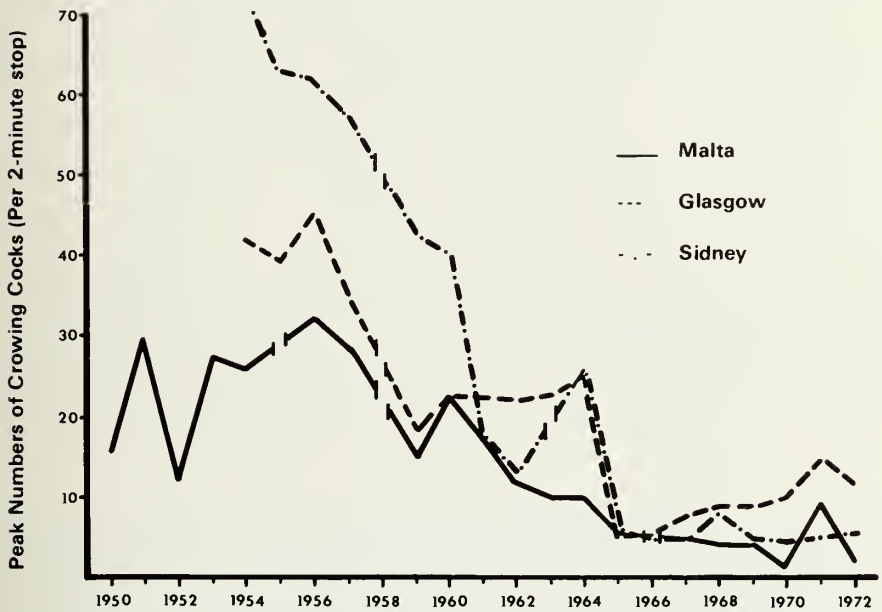


Figure 33. **Peak crowing cock counts in northeast Montana, 1950-72.**

Relative brood densities declined drastically between the mid-1950's and the late-1960's (Fig. 34). Densities along those routes surveyed showed noticeable declines from 1964 to 1965, again reflecting the tremendous adverse impact of the winter, 1964-65 on pheasant numbers.

Hunting success was measured in the Sidney area 1952-1965, except for 1959 and 1961 when poor weather conditions prevailed on opening day of the hunting seasons. Numbers of hunters and pheasants harvested per 100 hunters showed a long-term decline (Fig. 35). Apparently most hunters recognized the damage to pheasant numbers during the winter, 1964-65 and either hunted other game or stayed home the opening day of the 1965 pheasant season. In regard to the low turnout of hunters in 1965, the game manager reported "A checking station was operated at Sidney on opening day as in previous years. . . . Obviously, very few pheasant hunters were afield. Most hunters were not willing to spend the effort in

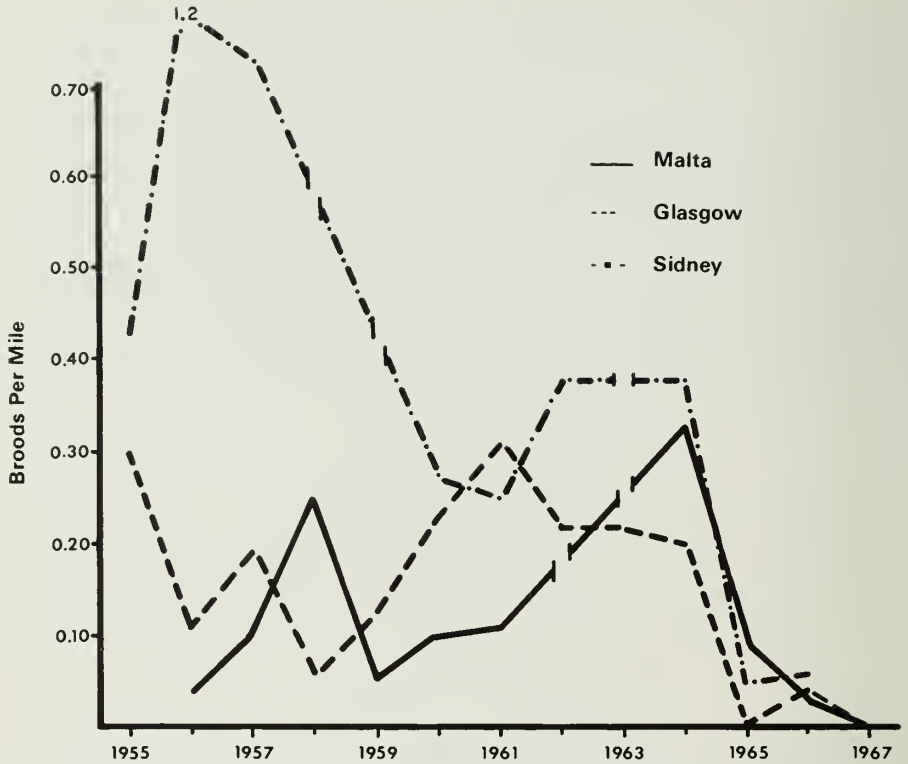


Figure 34. **Relative brood densities in northeast Montana, 1955-67.**

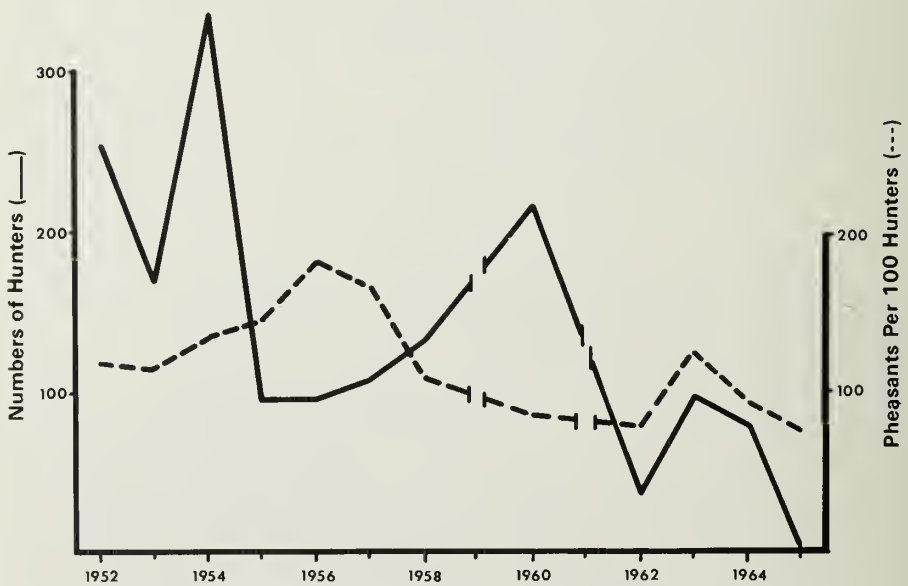


Figure 35. **Trends in numbers of hunters and in pheasants harvested per 100 hunters near Sidney, 1952-65.**

view of the low pheasant numbers — a good example of how hunting pressure tends to regulate itself when game populations are depressed."[147] Hunters averaged 2½ hours afield for each pheasant harvested, 1952-65. Check station operations at Sidney were suspended after low hunter numbers in 1965.

Examination of pheasant cocks at the Sidney check station showed 63 to 88 percent were juveniles (Table 39). Proportions of juveniles exceeded 80 percent of opening day harvest in 7 of 10 years indicating good production in most years.

A total of 2,849 banded, game-farm pheasants were released in this region (1960, 1961 and 1968). Hunters returned 252 bands, or 9 percent of the total birds released.

Table 39. **Percent juveniles in cock harvests on opening day near Sidney, 1952-64.**

Year	Percent Juveniles	Year	Percent Juveniles
1952	85	1958	78
1953	88	1960	85
1955	79	1962	86
1956	82	1963	85
1957	85	1964	63

Regional pheasant harvests in northeast Montana, 1958-73, peaked at 103,108 birds in 1964 and decreased 92 percent to 8,140 birds in 1965 (Table 40). Annual pheasant harvests since 1964 have all been below the 16-year average harvest of 27,345 birds. The top pheasant harvest-per-acre acounty in this region, 1967-73, was Sheridan; Richland County was the top pheasant yielder during 1970-72 (Table 41).

Islands of trees among cultivated fields on the Hi-Line sustain local pheasant populations.
—(Photo by J. P. Weigand)

Table 40. **Annual pheasant harvests in northeast Montana, 1958-73.**

Year	Pheasants Harvested	Percent of State Harvest
1958	31,649	14
1959	20,636	12
1960	21,692	14
1961	28,959	17
1962	31,956	17
1963	73,114	24
1964	103,108	29
1965	8,140	8
1966	24,030	11
1967	16,446	17
1968	11,353	12
1969	10,373	9
1970	11,558	12
1971	12,186	13
1972	12,589	19
1973	19,728	30
Average Harvest	27,345	—

Crop and Livestock Trends

Northeast Montana croplands increased from a recorded low of 1.7 million acres in 1924 to a record high of 2.8 million acres in 1955 (Fig. 36). Since 1955 there has been a gradual decline in cultivated land; there was a 13 percent decrease in cropland acreage between 1955 and 1970. Cereal grains have comprised 94 to 98 percent of the cultivated crops grown in this region. Sugar beets are an important cash crop in the Sidney area.

Alfalfa acreage increased from 38,500 acres in 1919 to 66,700 acres in 1929 and then decreased to 40,800 acres by 1940 (Fig. 36). Alfalfa acreage increased 405 percent between 1940 and 1970; the 165,000 acres of alfalfa in 1970 represented the all-time high.

Cattle numbers increased steadily between 1919 and 1970 except for sharp declines about 1950 and 1960 (Fig. 36). Notable cattle increases occurred during World Wars I and II, the Korean Conflict, and the Viet Nam War. The record high of 497,100 cattle in 1965 represented a 185 percent increase from cattle grazing Hi-Line ranges in 1950.

Pheasant Population and Habitat Evaluations

Northeast Montana environments are characterized by hot summers (many are also dry) and cold, windy, snowy winters. Early weather-farming-pheasant relationships along the Hi-Line were noted in a 1947 report.[148] "It seems to be quite a common belief among the farmers that good crop years are poor pheasant years and they cite back to the late thirties and early forties as being too dry for crops but peak

Table 41. **County pheasant harvest-rankings in northeast Montana, 1967-73.**

Year:	1967	1968	1969	1970	1971	1972	1973
Regional Rank:							
1	Sheridan	Sheridan	Sheridan	Richland	Richland	Richland	Sheridan
2	Hill	Blaine	Hill	Sheridan	Sheridan	Sheridan	Richland
3	McCone	Roosevelt	McCone	Roosevelt	McCone	McCone	McCone
4	Richland	Phillips	Roosevelt	McCone	Phillips	Roosevelt	Valley
5	Phillips	Valley	Richland	Hill	Roosevelt	Valley	Daniels
6	Blaine	Richland	Blaine	Valley	Blaine	Phillips	Phillips
7	Valley	McCone	Daniels	Blaine	Valley	Blaine	Roosevelt
8	Daniels	Hill	Phillips	Daniels	Hill	Hill	Blaine
9	Roosevelt	Daniels	Valley	Phillips	Daniels	Daniels	Hill

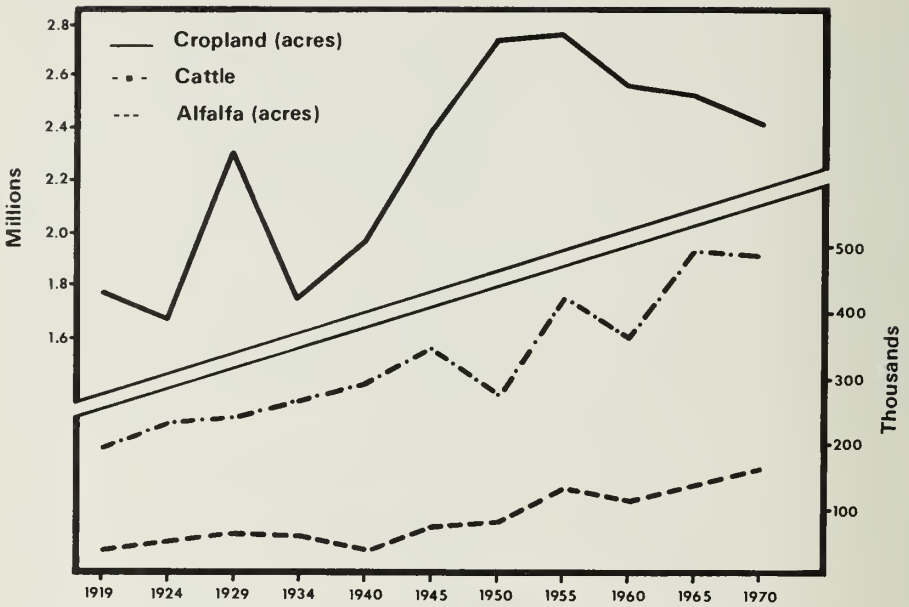


Figure 36. **Trends in grain crop and alfalfa acreages and cattle numbers in northeast Montana, 1919-70.**

pheasant population years." While these observations were valid, pheasant populations were building during years of increasing cropland acreages, low alfalfa acreages and approximately one-half the cattle numbers of the late 1960's.

The lack of winter cover has been a factor limiting pheasants in much of northeast Montana. Heavy pheasant mortality was noted in Sheridan County during the winter of 1946-47 and in other northeast Montana counties in the winter of 1949-50. Brush-clearing has been progressing at a slow but steady pace along stream and river bottoms since the 1960's.

Some of northeast Montana's best pheasant winter cover grows along the Milk River Valley. Many of the fields adjacent to this cover were formerly planted to grain. In December, 1969, 420 fields adjacent to U.S. Highway 2 from Havre to Malta were assigned general cover-types. Alfalfa represented 58 percent of the total fields, pastures occupied 32 percent and grain was grown on only 10 percent; half of the grain fields were fallowed. With the emphasis of cattle-forage growing in the Milk River Valley it is quite likely that the few existing grain fields are winter grazed thus reducing even further winter food supplies for pheasants.

Removal of food sources in the grain-to-alfalfa conversions are detrimental enough to pheasants; an alfalfa-growing economy provides additional hazards to pheasants through mowing operations. Alfalfa harvests, underway along the Milk River by the last 10 days in June, also harvest some of the annual pheasant production. Pheasant hatching peaks occurring prior to June 5 may yield better than average pheasant production in this area. Pheasant nests in alfalfa in Daniels, Roosevelt, Sheridan and Valley Counties are in even greater danger of being destroyed by mowers due to the mid-June cutting dates.

Two farming practices detrimental to pheasants in the Saco-Glasgow area

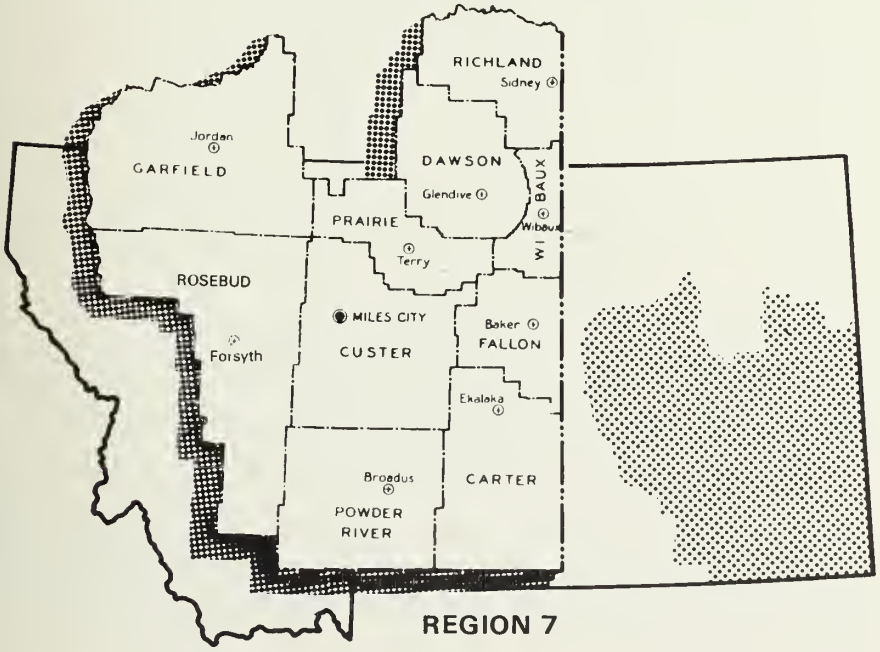
include cutting of corn for silage and of alfalfa for dehydration plant processing. Harvesting corn for silage removes all of the plant except for 6-inch stubble. No waste grain and no protective cover remain in this agriculturally-efficient process. Cutting and chopping alfalfa, which is later dehydrated and concentrated into livestock feed-pellets, occurs during pheasant nesting. Usually no nests and few pheasant hens survive these operations.

Sugar beets and corn grown for silage are major crops along the Yellowstone River in Richland County; neither crop provides much protective cover or food value.

Northeast Montana pheasant populations decreased drastically between the early 1950's and early 1970's; those in the Sidney area have suffered the most spectacular losses. Pheasant numbers were brought sharply to security thresholds during the winter of 1964-65. While numbers seem to be slowly increasing from this low, pheasant habitat continues to deteriorate. Recurrence of severe winter conditions will probably reduce pheasant populations to levels lower than in 1965. Until agricultural economics permit re-establishing food adjacent to winter cover and relaxation of livestock pressures on winter cover, pheasant populations should continue at low densities.

SOUTHEAST MONTANA

Most of the major pheasant range in southeast Montana corresponds to the Yellowstone River Valley, much of which is irrigated. Locally important pheasant ranges include downstream portions of Pumpkin Creek, Tongue River, Rosebud Creek and Sarpy Creek. Pheasants also occur in several dryland farming areas and along the Musselshell River. Land along the Missouri River in this region is virtually devoid of pheasant habitat and hence of pheasants.



REGION 7

Pheasant Surveys

Peak crowing counts in southeast Montana have shown some notable short-term fluctuations and a long-term declining trend, 1954-63 (Fig. 37). The winter of 1964-65 drastically reduced pheasant populations; spring surveys in 1965 reflected these losses. A severe hailstorm during the summer of 1965 further reduced pheasant numbers in the Kinsey area. Crowing counts since 1966 indicate some populations are gradually recovering from these natural catastrophes.

Pheasant hunting success information from southeast Montana check stations is presented in Table 5 (Page 49). A gradual decline in success from 1955 to 1959 was followed by a rapid surge to the 1963 high of better than two birds per hunter on opening day. Hunting success was attributed not only to increased ringneck numbers but also to the legalization of hen shooting. Daily limits progressed from cocks-only prior to 1960 to experimental one-hen in the daily bag in 1960, to either-sex shooting (3 birds per day) in 1961. These latter limits were in effect through 1967. Since 1967, 1 hen has been permitted in the daily 3-bird limit. The severe winter of 1964-65 all but eliminated pheasant populations in southeastern Montana. Since 1966, *and with continued hen harvests,* pheasants have been repopulating the project. By 1967, hunters were again averaging over one bird per man on opening day.

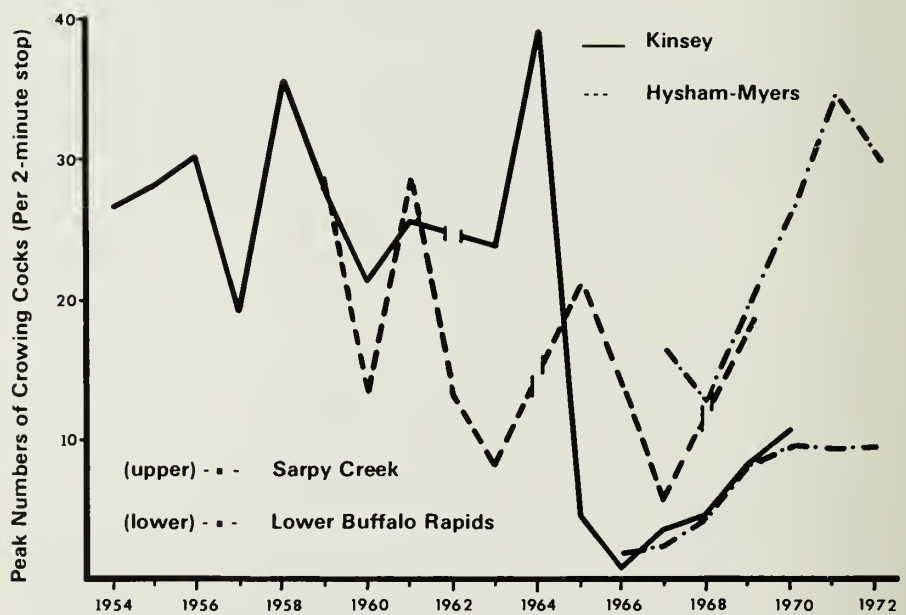


Figure 37. **Peak crowing cock counts in southeast Montana, 1954-72.**

Proportions of juveniles in the opening day or weekend cock harvests, 1955-70, ranged from 71 to 90 percent (Table 42), suggesting very good production in most years. During cocks-only seasons, 1955-59, juveniles averaged 78 percent of this harvest whereas an average 81 percent were juveniles during the hen harvest period, 1960-70. Hen harvesting did not adversely affect production according to these ratios.

Hens comprised 20 to 34 percent of opening day harvests under 1-hen per day limits and 39 to 46 percent of similar harvests when season-long, either-sex daily limits were in force (Table 43). Respective average hen harvests of 27 and 42 percent did not reach the full potential (33 percent during 1-hen per day seasons and 100 percent during either-sex seasons) of these liberalized limits.

Table 42. **Percent juveniles in cock harvests on opening day or weekend in southeast Montana, 1955-70.** [A]

Year	Percent Juveniles	Year	Percent Juveniles
1955	73	1961	77
1956	82	1962	90
1957	84	1964	82
1958	81	1967	85
1959	70	1969	78
1960	81	1870	71

[A] Kinsey check station data only, 1955-67; Kinsey data included with three other check stations in 1969 and with two other stations in 1970.

Table 43. **Percent hens on opening day or weekend pheasant harvests in southeast Montana, 1960-70**

Year	Percent Hens	Year	Percent Hens
1960[A]	34	1967	46
1961	39	1968[A]	21
1962	41	1969[A]	33
1963	40	1970[A]	20
1964	42		

[A] One hen allowed per day; remaining years, 3-bird either sex limits.

Regional pheasant harvests ranged from 1,560 to 33,769 birds annually during 1958-73 (Table 44). The 95 percent decrease in the harvest between 1964 and 1965 revealed the severity of the intervening winter. That pheasant harvests have not rebounded to pre-winter, 1964-65 levels indicates security thresholds have been coincidentally reduced. Top pheasant-per-acre harvests, 1967-73 in southeast Montana have occurred in Treasure and Dawson Counties (Table 45).

Crop and Livestock Trends

Cropland (non-hay) acreages in southeast Montana fluctuated considerably until about 1940; in less than 5 years, acreages increased from a 50-year low of 526,500 acres in 1940 to the 50-year high of 898,200 acres in 1945 (Fig. 38). There

Table 44. **Annual pheasant harvests in southeast Montana, 1958-73.**

Year	Pheasants Harvested	Percent of State Harvest
1958	21,946	10
1959	8,919	5
1960	11,475	7
1961	11,855	7
1962	17,891	9
1963	33,769	11
1964	32,221	9
1965	1,560	2
1966	7,670	4
1967	5,260	5
1968	6,837	7
1969	12,778	11
1970	9,428	10
1971	9,843	11
1972	7,482	11
1973	7,938	12
Average Harvest	12,930	—

Figure 38. **Trends in grain crop and alfalfa acreages and cattle numbers in southeast Montana, 1919-70.**

Table 45. **County pheasant harvest-rankings in southeast Montana, 1967-73.**

Year:	1967	1968	1969	1970	1971	1972	1973
Regional Rank:							
1	Treasure	Treasure	Treasure	Treasure	Dawson	Treasure	Dawson
2	Dawson	Rosebud	Powder River	Custer	Rosebud	Dawson	Treasure
3	Custer	Wibaux	Dawson	Dawson	Custer	(Custer &	Custer
4	Rosebud	Dawson	Rosebud	Rosebud	Treasure	Powder River)	Prairie
5	Powder River	Powder River	Custer	Powder River	Powder River	Rosebud	Rosebud
6	Wibaux	Custer	Wibaux	Garfield	Garfield	Garfield	(Garfield &
7	Prairie	Prairie	Fallon	Prairie	Prairie	(Prairie &	Carter)
8	Garfield	Garfield	Garfield	Fallon	Wibaux	Wibaux)	Fallon
9	Fallon	Fallon	Prairie	(Wibaux &	Fallon	Fallon	Wibaux
10	Carter	Carter	Carter	Carter)	Carter	Carter	Powder River

has been a decreasing trend in acres of cropland since 1945; between 1945 and 1970, 33 percent of the region's croplands were converted to non-grain crops.

Regional alfalfa acreages reached a 50-year low in 1940 (30,900 acres) and mushroomed 670 percent to the 50-year high in 1955 (Fig. 38)! Alfalfa acreage decreased slightly until about 1965 and then increased to near 1955-levels by 1970. The trend in alfalfa acreage has corresponded to trends in cattle numbers.

Cattle numbers ranged between 250,000 and 300,000 during 1919-29 and then decreased sharply during the drought of the 1930's (Fig. 38). From the 50-year low of 186,200 in 1940, cattle numbers increased 309 percent to the 50-year peak of 575,000 in 1970! Periodic peaking of cattle numbers coincided with years of international conflict.

Pheasant Population and Habitat Evaluation

Much of southeast Montana is rangeland dominated by sagebrushes and greasewood. They are inhabited by native sage grouse and sharp-tailed grouse and will not support large numbers of the exotic ringneck. The pheasant has become established where grain crops cultivated on dryland areas, are interrupted by wooded draws, and where irrigation has permitted grain-growing.

The loss of one-third of grain crop acreages in the region, 1945-70, with an average loss of 11,000 acres per year, is not conducive to maintaining large pheasant populations. If these grain lands are now growing alfalfa, the losses to pheasants are compounded.

Alfalfa is harvested earlier in this region than other regions of Montana. Average first-cutting dates for alfalfa occur before June 10 in Custer, Rosebud and Treasure Counties. The peak week of pheasant hatching in Custer County is May 30 - June 5; 29 percent of the chicks hatch during this week and 56 percent hatch during May 23 - June 12. Few nesting hens, nests and young chicks in alfalfa would escape mowing operations and pheasant production in this area is no doubt considerably below its potential. Similarly, pheasant production in Prairie and Wibaux Counties would suffer setbacks with their June 11-20 alfalfa harvests. In Dawson County, alfalfa cutting begins after June 21 and late nesting or hatching would be seriously affected.

In 1968, excellent winter cover was observed along Beaver Creek from Wibaux to the North Dakota-Montana boundary. Some dryland livestock grazing and wheat farming occurs on the slopes and floodplains of this creek. In 1968 there appeared to be heavier winter grazing by cattle and more acreage in alfalfa than when inspected in 1960-61. There was good interspersion of food and cover along Beaver Creek from Wibaux to St. Phillips; a reduction in livestock grazing would probably improve the quality of this pheasant range. South of St. Phillips the density of woody vegetation along Beaver Creek is much reduced compared to that farther north. While pheasants persist in low densities in this area, they could be increased by establishing additional winter cover.

The Lower Buffalo Rapids Project between Terry and Glendive represents a mixed dryland-irrigated pheasant range. Wheat is cultivated on the terrace above the Yellowstone River while alfalfa is grown on the floodplain. The slopes between the two levels contain coulees vegetated with cottonwoods, rose, big sagebrush and

Good interspersion of woody (winter) cover and grain (food) along Beaver Creek south of Wibaux. Take either one away and pheasants will disappear. *(Photo by J.P. Weigand)*

The Kinsey Irrigation Project near Miles City has escaped extremely intensive grazing and pheasants still inhabit available cover. *(Photo by J.P. Weigand)*

skunkbush sumac which provide winter cover. When high pheasant populations occur, this area provides a major pheasant range for local hunters.

The Kinsey Irrigation Project lies east of Miles City along the north side of the Yellowstone River. This locally popular pheasant range was established shortly after the introduction of irrigation in 1940. The primary cash crop for the project is sugar beets. Except for furnishing brood cover in late summer, sugar beets contribute very little to pheasant habitat. Corn, a secondary project crop, potentially fulfills some of the pheasant's annual needs. Much of the corn stubble is grazed, however, and potential pheasant cover and food ends up as pounds of beef. Although wheat is a minor crop, the waste grain serves as pheasant food.

Kinsey Project pheasants are fortunate in that terrain appears too rough for intensive cultivation of all areas. Large irrigation ditches, coulees, and other "roughs" are not grazed intensively and the resulting growth of cottonwood, Russian olive, rose, big sagebrush, grasses and forbs provide necessary year 'round cover. The lack of burning along railroad right-of-way, borrow pits and along ditches has resulted in some high quality nest and brood cover. Periodic dredging or cleaning of irrigation ditches is a short-term liability for pheasants. A disturbing observation in 1968 was the trend toward mechanical destruction of trees and shrubs along irrigation ditches. Unless replaced with similar cover, elimination of this woody vegetation will mean less shelter and consequently fewer pheasants.

The Tongue River area typifies the developing cattle-hay industry plaguing pheasants in other Montana regions. While heavy winter cover still exists along the floodplain, small-grain crops occupy only limited acreage adjacent to the winter cover. Pheasants persist because of this protective cover and numbers could be increased by increasing grain acreages. Destruction of the winter cover, by any means, will destroy the pheasant population.

The major cash crop on the Hysham Irrigation Project is sugar beets; corn also occupies a significant part of the Project's cropland. The cattle-alfalfa economy has a strong foothold on the Project and winter cover was sparse in 1968. Lateral ditches and idle areas occasionally had big sagebrush, yellow sweet clover, cattails and various grasses when ungrazed. Cottonwoods and willows were dominant along the Yellowstone River. Grass-shrub cover in coulees adjoining the Project on the south was limited. Corn, a major source of winter food, was fall plowed. Less intensive farming and grazing plus establishment of more winter cover would foster long-term high pheasant numbers.

During October and November, 1967, crops were collected from pheasants bagged by hunters. In October, waste grain (wheat and corn) made up 55 percent of the contents, alfalfa was 9 percent and sunflower seeds comprised 4 percent. In November, grain had decreased to 33 percent of the contents while weed seeds made up 37 percent. Administrators of weed control programs in southeast Montana are well-advised to obtain assistance from Department biologists in planning their programs; the wrong decisions could result in loss of valuable early winter pheasant food sources.

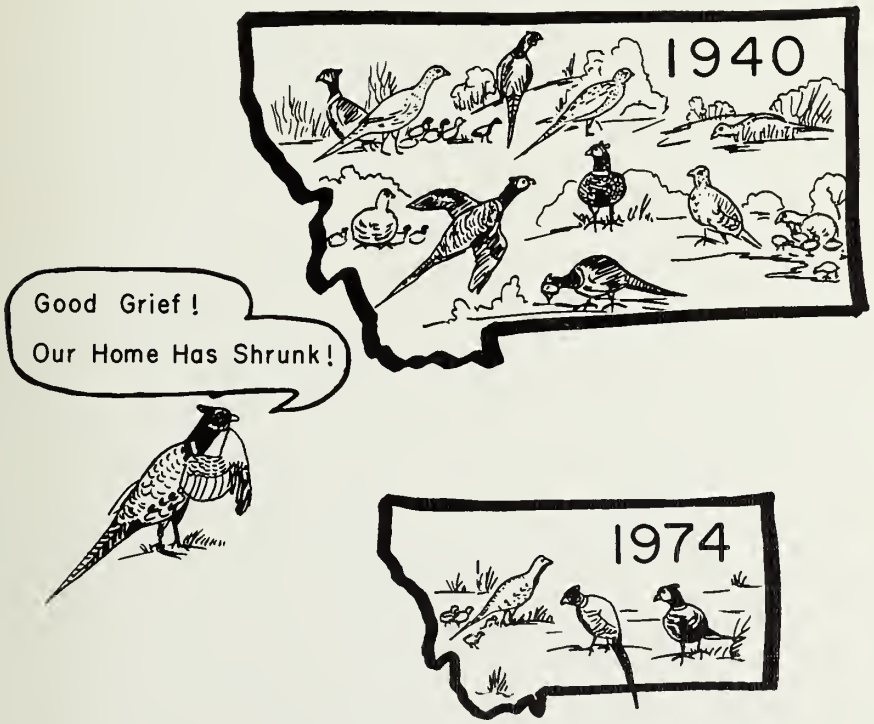
Pheasants in southeast Montana are presently holding their own. The impact of cattle grazing in winter ranges, while certainly noticeable, has not been as great as in other parts of Montana. Apparently dryland ranges have absorbed much of the tremendous increase in cattle numbers. The establishment of cattle feedlots in the

Yellowstone Valley in the early 1970's, annual losses of croplands to other uses, and the increases in alfalfa acreages indicate that all is not well in previously serene pheasant habitats. Occurrence of abnormally severe winters may dictate pheasant populations exist at levels much lower than previously experienced. The supply of pheasants is more than adequate to meet the demands of local hunters, but influxes of new "resident" hunters via the coal-energy developments could result in crowding hunting pressure into shrinking pheasant habitats. While ringnecks can withstand additional hunting pressure it is questionable whether the land managers can tolerate it.

SUMMARY

In this chapter we have compiled private-land use information for each of the seven Montana Department of Fish and Game administrative regions. The information used was provided to state and federal agricultural reporting services by landowners. Statistics are reported for 1919-1970 since this covers the period during which land uses affected pheasant populations.

Survey information indicates pheasants have not been able to cope with decreasing cropland acreages, increasing alfalfa acreages and increasing numbers of livestock. Pheasant populations confronted with this combination of conditions declined. The present pheasant decline, which began in the 1950's, is attributed to these conditions and the closely related deterioration of pheasant habitat.



5

THE FUTURE OF PHEASANTS IN MONTANA

Pheasant numbers in Montana in the future, as in the past and present, will continue to fluctuate locally, regionally and statewide in accordance with changes in habitat and weather. Pheasants have adapted to certain habitat and climatic conditions. Man has altered that habitat, and is now attempting to alter weather, without realizing the full impact of his actions. The pheasant has been able to adapt to some habitat changes (e.g. pheasants eat corn when it is available, or in the absence of corn they subsist very well on wheat). The pheasant has not been able to adapt to many of the changes (like reduction in quality and quantity of protective cover) in Montana's habitats.

Complaints of too many pheasants and of too few pheasants have been registered by landowners. Possibly at no time was the supply of pheasants "just right" to accommodate demands of hunters. It is very likely that landowners tolerances for pheasants and pheasant hunters cannot be perfectly balanced with the desires of hunters for pheasants. It is evident, however, that the current supply of pheasants is considerably lower than either group desires.

Although the kinds and abundance of predators have fluctuated and hunting regulations and hunting pressures have varied, they have had only short-term, if any, effects on pheasant populations in Montana. The factors which have had the most noticeable effects on pheasants over the past 50 years involved land uses and land management practices. They are the factors which most closely coincide with the long term trends of pheasant abundance. *They are, and will continue to be, the factors limiting overall pheasant abundance.*

AGRICULTURAL ECONOMICS AND ENVIRONMENTAL TRADE-OFFS

Environmental factors influencing pheasant numbers in Montana necessarily involve the economics of farming and ranching. And *agricultural economics*, in turn, *necessarily involve environmental trade-offs.*

Will this young boy enjoy similar hunting success 15 years from now?
(Photo by J.P. Weigand)

The history of Montana's agricultural development illustrates how economics and these trade-offs have occurred. The upland game bird niche on Montana's pre-settlement prairies and mountain valleys was occupied by native grouse. Introduction of domestic livestock into these areas was economically beneficial to cattlement and woolgrowers, but it signaled the retreat of grouse populations. Thus, original grouse populations were traded for beef, wool and mutton.

Cultivation of native sod for grain growing was economically beneficial to

An environmental trade-off: breaking of the prairie sod on the Valier Irrigation Project removed sharp-tailed grouse range but resulting cereal grains benefitted pheasants.
(Photo Courtesy of Montana Historical Society)

farmers, but it made additional inroads on native grouse environments, thus we traded some of the remaining grouse for grain production. The cultivated grainland, however, eventually provided an excellent environment for exotic ringnecks. After pheasants were introduced and established, we had, in effect, traded native grouse for grain production plus a new upland game bird population.

Had these environmental trade-offs ceased during the early 1940's, overall upland game bird populations, natives as well as exotics, might have "stabilized" at desirable levels (for land managers and hunters). But environmental trade-offs, under agricultural technology aimed at greater efficiency and additional profits have continued.

Land uses have changed and farming and ranching management practices have intensified. Rangelands have been subjected to increased grazing pressure. Increasing numbers of cattle graze hay and grain stubbles and agriculturally idle areas. To assure better annual grain production (weather is still a recognized variable), croplands are treated with chemicals to reduce losses to fungus and insect attacks and invasion by undesirable vegetation. Individually and collectively, these practices represent trading grouse and pheasants for short-term economic benefits to land managers.

Agricultural Economics and Pheasants

The ringnecked pheasant is one product of an agricultural environment. Primary pheasant habitat in Montana coincides with cropland areas. Since most Montana pheasant habitat occurs on privately-owned lands, efforts to restore pheasant numbers to greater levels of abundance will have to be directed toward private lands.

Asking a farmer to be a "poor farmer" (i.e., produce crops at less than maximum capability) is fighting human nature.[126] A recent Minnesota study revealed 10 percent of the landowners were genuinely interested in wildlife (to the point of establishing wildlife habitat at their personal expense), 10 percent were against wildlife and 80 percent "would develop habitat for a price".[149]

Obtaining public recognition that habitat improvement is requisite to increasing pheasant numbers has often been difficult. Determining who will financially support this improvement has been, with a few exceptions, equally difficult. That a majority of landowners will develop pheasant habitat for a price indicates they are not willing to lend sole support. Funding limitations of the Montana Department of Fish and Game and fears of further extending public land ownership prevent acquisition and development of sufficient habitat to meet the pheasant demands of hunters. A majority of Montana's pheasant hunters retain more interest in hunting regulations than in habitat development; only a few sportsmen associations have volunteered time and labor in assisting landowners to develop pheasant habitat.

The most economically feasible approach to significantly reverse Montana's rapidly deteriorating pheasant habitat trends is through federally-funded land-use conversion and land retirement programs. A quarter-century of experience with previous such programs suggested the following guidelines for future programs:

1. Land retirement contracts should be for a minimum of 3 years and preferably for 5 years;

—retired acres should be seeded with perennial grass-legume mixtures;

—retired acres should remain undisturbed except for spot-clippings or spot-spraying (with selective herbicides) for noxious weed control;

—retired acres should be within 1 mile of established woody cover having positive pheasant-winter protection value;

—grazing on retired acres by domestic livestock should be disallowed.

2. 10-year contracts should be available for scattered tracts of 10 acres or less; such acreages should include establishment of trees, shrubs and water impoundments.
3. There should be only limited retirement of surplus cropland under annual contracts;

   —acreages should be seeded to annual cover crops with designated species at specified seeding rates prior to specified dates;

   —noxious weed control should be limited to spot-clipping or spot-spraying (with selective herbicides);

   —fallowing to be permitted after specified dates;
4. Retirement of small acreages over larger areas is preferred to large acreages in confined areas (i.e. partial-farm rather than entire-farm retirement);
5. Land retirement acreage payments should be sufficiently high to attract landowners to long-term programs;

   —payments should reimburse the landowner for seed and labor costs involved in establishing wildlife cover and partial reimbursement for fencing costs and labor;
6. Planning and implementing of land retirement program provisions should be guided by a state committee consisting of the U.S. Soil Conservation Service, U.S. Agricultural Stabilization and Conservation Service and the Montana Department of Fish and Game;

   —program provisions should be actively enforced by the responsible federal agencies.

Once these land management programs are available, landowner participation should be encouraged by all federal and state natural resource agencies in Montana and by Montana sportsmen. It should be recognized, however, that high-value, productive croplands will probably not be enrolled in these programs. Only major changes in farming economics will bring about extensive land-use changes in high-value areas.

PHEASANTS AS ENVIRONMENTAL INDICATORS

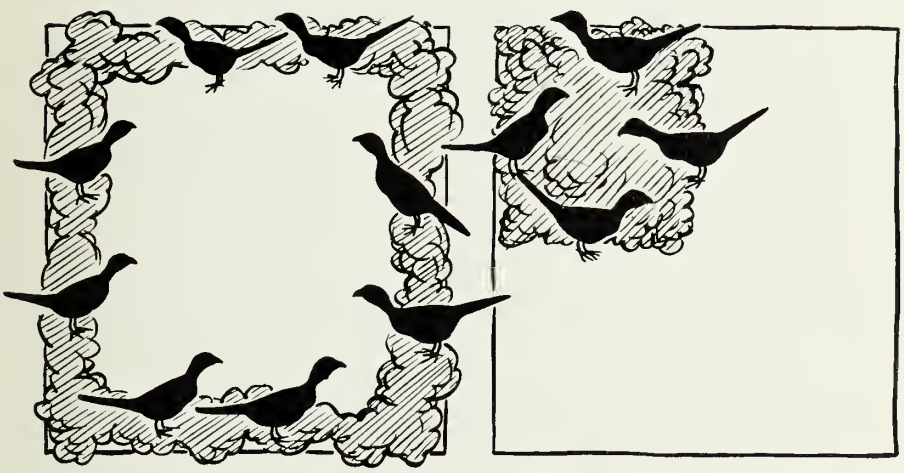
Ecologists recognize that the most stable environments are diverse environments, and that simplified or monocultural environments are highly unstable. In 1964, Robert Rudd[150] stated: "Reduction in the complexity of the biotic elements in living communities is the natural consequence of converting lands to the cultiva-

tion of single, or at best, a few crop species . . . the effect of land conversion is to push back . . . toward pioneer, maintaining a permanent subclimax, and hence unstable, community." And he added: "Simplification for efficiency of *(agricultural crop)* *harvesting is a relatively new practice. So also is the practice of large-scale monocultural farming. These elements offer the base for catastrophic instability." The communities referred to by Rudd are those on which our society depends for food and fiber.

A recent pheasant study in Montana pointed out the pheasant's preference for diverse, rather than simplistic, habitats.[30] Pheasants do not thrive in areas of low habitat diversity. Liberty County, on the Montana-Canada border, represented the northern wheat growing regions in a recent USDA study.[67] It recorded the lowest agricultural diversity of 8 counties studied in the United States. In 1970, Liberty County ranked 31st of 52 Montana counties in pheasants harvested per acre.

Private land managers are increasingly commenting that pheasants do not provide them with immediate cash returns as do grain, alfalfa or livestock. Whether this is true or not depends on the management system employed by the individual land manager. Evidence is mounting that the abundance of pheasants, even if they do not provide immediate cash returns, provides many land managers with an index of the long-term "environmental health" of their operations. Large numbers of wild pheasants may show these operations are ecologically stable, and with less likelihood of catastrophic outbreaks of insect and plant pests. Land managers in areas which once supported an abundance of pheasants but which are now in a "pheasant famine" however, may be counting large, short-term profits at the expense of long-term, successful operations.

*Words inserted by authors to continue context of the quotation.



DISTRIBUTION OF FOOD AND COVER IS IMPORTANT. TEN ACRES OF COVER SURROUNDING A FIELD IS MORE EFFECTIVE THAN A 10-ACRE SQUARE IN ONE CORNER.

A PHEASANT MANAGEMENT OBJECTIVE FOR MONTANA

To protect, perpetuate and utilize the ring-necked pheasant in Montana for the benefit of Montanans consistent with the capabilities and requirements of pheasants and the environment on which they depend for existence.

If this objective represents the objective of those people concerned about maintaining, or increasing, pheasants in Montana in the future, there are certain obligations which these people *must* meet. Obligations for each group of people are stated below. Failure to meet these obligations on the part of any one of these groups will prevent everyone from reaching the ultimate objective. And failure to meet this objective will result in the further reduction of pheasant populations in Montana.

Obligations of Private Land Managers

1. Recognize that development and maintenance of pheasant habitat is the key to pheasant abundance;
2. Incorporate pheasant and other farmland game habitat into land use planning;
3. Examine land management practices and eliminate those which are detrimental to pheasants (e.g. draining wetlands; burning or intensely grazing crop stubbles, idle and wooded areas; unncessary use of pesticides). When pesticide-use is necessary, consult the Montana Department of Fish and Game for advice on which chemicals will provide the least damage to pheasants and other wildlife;
4. Keep informed on proposed federal and state agricultural programs, particularly those which provide the monetary incentives to develop and maintain pheasant and other wildlife habitat. Participate in those programs which benefit pheasants and other wildlife;
5. Request assistance from local sportsmen groups (for labor or in sharing in costs) in developing pheasant habitat and in policing your property for vandalism; and
6. Consult the Montana Department of Fish and Game for assistance in any problems which arise in providing recreational opportunities to the public.

Obligations of Sportsmen

1. Insist that the Montana Department of Fish and Game use factual, scientific information as the base of its pheasant management program;

2. Recognize that development and maintenance of pheasant habitat is the key to pheasant abundance, and that stocking game farm-reared pheasants, predator control, and restrictive hunting regulations will not solve the present pheasant decline;
3. Keep informed on proposed federal and state agricultural programs, particularly those which affect expenditure of public funds for land uses and land management practices. *Actively support* those programs which benefit pheasants and other farmland game and *actively oppose* those programs which are detrimental to these resources;
4. Actively demonstrate that the sincere, responsible segment of sportsmen appreciate the land manager's efforts in providing the necessary habitat for pheasants and a place to hunt for sportsmen;
5. Assist land managers with labor or sharing costs in developing pheasant habitat when assistance is requested;
6. Assist the land manager and the Montana Department of Fish and Game in eliminating vandalism by reporting such activities to the nearest law enforcement official;
7. Respect the land manager's property and his directions; *you are a guest on his land.*

Obligations of the Montana Department of Fish and Game

1. Inventory pheasant populations throughout Montana;
2. Regulate the hunting of pheasants to provide optimum harvest levels and to insure protection for base breeding stocks;
3. Measure public use of pheasant resources and determine future supplies of and demands for pheasants;
4. Inventory and classify pheasant habitats in Montana;
5. Determine the effects of land uses, land management practices and other man-caused phenomena that could influence the quality and quantity of pheasant habitat;
6. Inform the public and other government agencies of those human activities which are beneficial or detrimental to pheasants and pheasant habitats;
7. Take an official position in support of those human activities beneficial to pheasants and against those activities which threaten pheasants;
8. Provide counsel to land managers, private and public, on land uses and management practices necessary to perpetuate pheasants in Montana;
9. Acquire land (within financial and social limitations), develop and maintain pheasant habitat which can support pheasants; and
10. Provide optimum pheasant-oriented recreation opportunities on Department-managed lands.

Obligations of Government Agricultural Agencies

1. Recognize that high pheasant populations are produced on good to excellent, not "scab", farmland; past and present land classifications relegate pheasants and other farmland wildlife to existence on only those lands where cash crops (grain, cattle, livestock forage and timber) cannot be profitably raised;
2. Recognize the positive values of wildlife and incorporate provisions for wildlife habitat on public land. Pheasants and other wildlife are indicators of the environmental "health" of the land entrusted for management for all publics;
3. Expenditure of public funds on private lands should benefit, not detract from, wildlife and its requisite habitat.
4. Actively solicit participation of private land managers in those programs (which utilize public funds) which benefit wildlife.
5. Actively enforce the provisions of those programs (supported by public funds) which are intended to benefit wildlife; and
6. Regularly consult Montana Department of Fish and Game biologists at local, regional, and state levels on those programs which will, in any way, affect wildlife.

Obligations of Other Government Agencies

1. Encourage the placement of Montana Department of Fish and Game biolo-

Scenes like this can again become frequent in Montana when land managers, sportsmen and the Montana Department of Fish and Game combine their efforts in developing pheasant habitat. *(Photo by J.P. Weigand)*

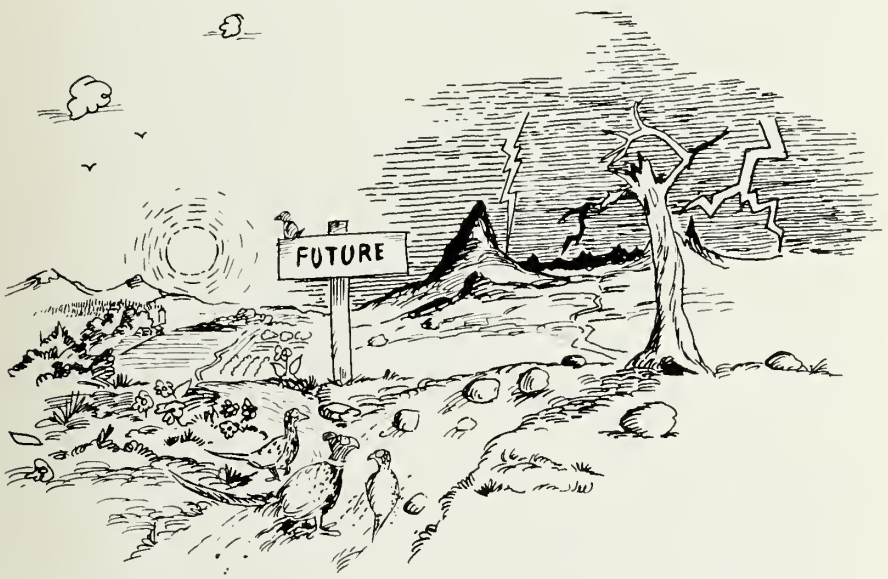
gists on standing state, county or local committees which deal with environmental problems. Biologist input in program planning could avoid problems and controversies from arising; and

2. Consult Montana Department of Fish and Game biologists on special environmental problems.

SUMMARY

The maintenance of the pheasant in Montana in the future is best described as precarious. This is due primarily to the dependence of pheasants on the maintenance of requisite habitat on privately-owned land. Decisions by the private land managers on how their land is to be used, and which management practices will be used, depends to a large degree on the demands and economics of our society. Our society includes all of us! Those of us concerned about the welfare of pheasants in Montana (this includes hunters, landowners, the Montana Department of Fish and Game, other government conservation and agricultural agencies) must cooperate more than in the past if pheasants are to be perpetuated for everyone's enjoyment in the future.

If maintaining or improving pheasant habitat isn't our "bag" now, chances are excellent there will be fewer pheasants in our bag in the future.



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APPENDIX I

Recommendations Regarding Pesticide-Use in Montana

To minimize the effects of pesticides on wildlife two concepts must be recognized:

1. Insecticides are an environmental insult; they disrupt, in some manner, the natural processes of any given ecosystem;
2. Continued or increased ecosystem disruption can lead to a simplified, unnatural and unstable environment on which humans as well as wildlife depend for existence.

Once these concepts are accepted it follows that pesticide use must be curtailed if their effects are to be minimized. The most important decision the land manager must make is *whether* the use of a pesticide is absolutely necessary. Changes in land management philosophy, which must precede changes in land use practices, could minimize the number of these decisions he may face in the future.

When pesticide use is deemed absolutely necessary:

1. Pesticides causing the least environmental damage should be used;
2. Application rates should be strictly adhered to;
3. Pesticides should be applied only to known problem sites;
4. Surplus pesticide should not be applied on adjacent areas merely for the sake of disposal, they should be safely stored or disposed of in a manner which will not further contaminate the environment;
5. Residues resulting from cleaning spray equipment contain active pesticide and should be deposited in a manner which cause no environmental contamination.

Pesticide application decisions should reflect the full consideration of human health and environmental impacts as well as economic considerations. The Montana Department of Fish and Game is willing to assist in these decisions; the final decision on pesticide-use is made by the land manager.

APPENDIX II

Appendix II. **Montana pheasant hunting seasons, 1928-1974.**

Year	Dates	Daily Bag	Possession Limit	Area Open
1928*	Nov. 24-25	3 cocks	3 cocks	Portions of Carbon, Ravalli, Missoula, Lake Counties
1929	Nov. 24-28	3 cocks	6 cocks	Portions of Carbon, Ravalli, Missoula, Lake Counties
1930	Nov. 23-27	3 cocks	6 cocks	Portions of Sanders, Ravalli, Missoula, Lake Counties
1931	Nov. 8-12	3 cocks	6 cocks	Portions of Yellowstone, Sanders, Ravalli, Missoula, Lake Counties
1932	Oct. 30-Nov. 3	3 cocks	6 cocks	Statewide with closures in certain areas
1933	Oct. 29-Nov. 5	3 cocks	6 cocks	Statewide with closures in certain areas
1934	Oct. 21-30	3 cocks	6 cocks	Statewide with closures in certain areas
1935	Nov. 3-12	3 cocks	6 cocks	Statewide with closures in certain areas
	Nov. 3-17	3 cocks	6 cocks	Extended in certain counties
1936	Nov. 8-17	3 cocks	6 cocks	Statewide with closures
1937	Oct. 31-Nov. 4	3 cocks	6 cocks	Statewide with closures; except:
	Oct. 31-Nov. 9	3 cocks	6 cocks	Bighorn County
1938	Oct. 30-Nov. 6	3 cocks	6 cocks	Statewide except game preserves
1939	Oct. 29-Nov. 12	3 cocks	6 cocks	Statewide except game preserves
1940	Nov. 10-Dec. 1	3 cocks	6 cocks	Statewide except game preserves and:
	Nov. 10-Dec. 11	3 cocks	6 cocks	Portion of Carbon County
1941	Oct. 26-Nov. 16	3 cocks	6 cocks	Statewide except game preserves.

*First hunting season on pheasants in Montana.

Appendix II. **(continued)**

Year	Dates	Daily Bag	Possession Limit	Area Open
1942	Sept. 26-Oct. 7	5 either sex	10 either sex	Big Horn, Treasure, Yellowstone Counties
	Oct. 25-Nov. 15	3 cocks	6 cocks	Statewide, except:
	Oct. 25-Nov. 22	4 pheasants - may include 1 hen	8 pheasants - may include 2 hens	13 eastern counties
	Oct. 25-Nov. 22	4 cocks	8 cocks	Dawson County
	Closed	- -	- -	Lincoln and Park Counties, part of Meagher County and Nevada Creek Valley in Powell County
1943	Oct. 31-Nov. 30	3 cocks	6 cocks	Statewide, except:
		7 pheasants - may include 2 hens	14 pheasants - may include 4 hens	Richland and Roosevelt Counties;
		5 pheasants - may include 1 hen	10 pheasants - may include 2 hens	Blaine, Hill, Phillips and Valley Counties;
		5 cocks	10 cocks	Dawson County
		4 cocks	8 cocks	11 west and west-central counties
		4 pheasants - may include 1 hen	8 pheasants - may include 2 hens	Big Horn, Custer, Carbon, Rosebud, Stillwater, Treasure and Yellowstone Counties
	Nov. 6-Nov. 30	4 cocks	8 cocks	
	Closed	- -	- -	Glacier, Lincoln and Mineral Counties, part of Meagher County and Nevada Creek Valley in Powell County

Appendix II. **(continued)**

Year	Dates	Daily Bag	Possession Limit	Area Open
1944	Oct. 29-Nov. 19	3 cocks	6 cocks	Statewide, except 3 closed counties
	Oct. 29-Nov. 30	3 cocks	6 cocks	Daniels, Sheridan Counties
		5 cocks	10 cocks	8 northeastern counties
1945	Oct. 28-Nov. 18	3 cocks	6 cocks	Statewide, except 5 closed counties
	Oct. 28-Oct. 31	3 cocks	6 cocks	6 southcentral counties
1946	Season closed statewide			
1947	Oct. 26-Nov. 2	2 cocks	2 cocks	Statewide, except in closed areas
1948	Oct. 31-Nov. 11	3 cocks	3 cocks	Statewide, except in closed areas
1949	Oct. 30-Nov. 13	3 cocks	3 cocks	Statewide, except in closed areas
1950	Nov. 5-12	2 cocks	2 cocks	Statewide, except in closed areas
1951	Oct. 28-Nov. 12	4 cocks	4 cocks	Statewide, except in closed areas
1952	Oct. 26-Nov. 11	3 cocks	3 cocks	Statewide, except in closed areas
1953	Nov. 8-12	2 cocks	2 cocks	Statewide, except in closed areas
1954	Nov. 7-21	3 cocks	3 cocks	Statewide, except in closed areas
1955	Nov. 6-20	3 cocks	3 cocks	Statewide, except in closed areas
1956	Oct. 28-Nov. 11	3 cocks	3 cocks	Statewide, except in closed areas
1957	Oct. 27-Nov. 17	3 cocks	3 cocks	Statewide, except in closed areas
1958	Oct. 26-Nov. 16	3 cocks	6 cocks	Statewide, except in closed areas

Appendix II. **(continued)**

Year	Dates	Daily Bag	Possession Limit	Area Open
1959	Oct. 25-Nov. 22	3 cocks	6 cocks	Statewide, except:
	Oct. 25-Nov. 22	5 cocks	10 cocks	Portion of Richland County
	Oct. 25-Nov. 1	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Portions of Cascade and Teton Counties
1960	Oct. 23-Nov. 20	3 cocks	6 cocks	Statewide, except:
	Oct. 23-30	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Portion of Custer County
	Nov. 13-20	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Portions of Cascade and Teton Counties
	Oct. 23-Nov. 20	5 cocks	10 cocks	Portion of Richland County
1961	Oct. 22-Nov. 19	3 cocks	6 cocks	Statewide, except:
	Oct. 22-29	3 either sex	6 either sex	Portion of Custer County
	Oct. 22-29	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Portions of Cascade and Teton Counties
	Nov. 5-12	3 cocks	6 cocks	Fort Peck Game Range
1962	Oct. 14-Nov. 11	3 cocks	6 cocks	31 counties
	Oct. 14-Nov. 11	3 cocks - may include 1 hen	6 cocks - may include 2 hens	15 southcentral and southwest counties

Appendix II. **(continued)**

Year	Dates	Daily Bag	Possession Limit	Area Open
1962	(continued)			
	Oct. 14-Nov. 11	3 either sex	6 either sex	10 southeastern counties
	Oct. 14-21	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Portions of Cascade and Teton Counties
	Nov. 4-11	3 cocks	6 cocks	Portion of Fort Peck Game Range
1963	Oct. 13-Nov. 3	3 cocks	6 cocks	12 northcentral counties
	Oct. 13-14	3 cocks	6 cocks	Portion of Cascade County
	Oct. 13-Nov. 11	3 either sex	6 either sex	12 southeastern counties
	Oct. 13-Nov. 11	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Remainder of state
1964	Oct. 11-Nov. 11	3 cocks	6 cocks	Montana west of Continental Divide
	Oct. 25-Nov. 29	3 cocks - may include 1 hen	6 cocks - may include 2 hens	East of Continental Divide except southeast
	Oct. 25-Nov. 29	3 either sex	6 either sex	12 southeastern counties
1965	Oct. 31-Nov. 28	3 cocks	6 cocks	West of Divide and Cascade, Teton, Chouteau and Lewis and Clark Counties
	Oct. 31-Nov. 28	3 cocks - may include 1 hen	6 cocks - may include 2 hens	22 counties in northern and southwest Montana

Appendix II. **(continued)**

Year	Dates	Daily Bag	Possession Limit	Area Open
1965	(continued)			
	Oct. 31-Nov. 21	3 either sex	6 either sex	13 southeastern counties
	Oct. 31-Nov. 28	3 either sex	6 either sex	8 southcentral counties
1966	Oct. 30-Nov. 27	3 cocks	6 cocks	22 western counties
	Oct. 30-Nov. 27	3 cocks - may include 1 hen	6 cocks - may include 2 hens	14 northern counties
	Oct. 30-Nov. 27	3 either sex	6 either sex	12 southcentral counties
	Oct. 30-Nov. 6	3 either sex	6 either sex	8 southeastern counties
1967	Oct. 29-Nov. 26	3 cocks	6 cocks	13 northwestern counties
	Oct. 29-Nov. 5	3 cocks - may include 1 hen	6 cocks - may include 2 hens	9 southwestern counties and 2 northern counties
	Nov. 6-26	3 cocks	6 cocks	9 southwestern counties and 2 northern counties
	Oct. 29-Nov. 26	3 cocks - may include 1 hen	6 cocks - may include 2 hens	20 central and northern counties
	Oct. 29-Nov. 26	3 either sex	6 either sex	4 southeastern counties
	Oct. 29-Nov. 12	3 either sex	6 either sex	8 southeastern counties

Appendix II. **(continued)**

Year	Dates	Daily Bag	Possession Limit	Area Open
1968	Nov. 2-24	3 cocks	6 cocks	43 counties
	Nov. 2-17	3 cocks - may include 1 hen	6 cocks - may include 2 hens	12 southeastern counties
	Nov. 2-3	2 cocks	4 cocks	Daniels County
1969	Oct. 25-Nov. 23	3 cocks - may include 1 hen	6 cocks - may include 2 hens	West of Continental Divide
	Oct. 25-Nov. 30	3 cocks - may include 1 hen	6 cocks - may include 2 hens	East of Continental Divide
1970	Oct. 24-Nov. 29	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Statewide, except in closed areas
1971	Oct. 23-Nov. 28	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Statewide, except closed areas and:
	Oct. 23-Nov. 28	3 cocks	6 cocks	Yellowstone County, north of Yellowstone River
1972	Oct. 22-Nov. 26	3 cocks - may include 1 hen	6 cocks - may include 2 hens	Statewide, except closed areas and:
	Oct. 22-Nov. 26	3 cocks	6 cocks	Lake County; Yellowstone County, north of Yellowstone River

Appendix II. **(continued)**

Year	Dates	Daily Bag	Possession Limit	Area Open
1973	Oct. 21-Nov. 25	3 cocks	6 cocks	21 western counties
	Oct. 21-Nov. 25	3 cocks - may include 1 hen	6 cocks - may include 2 hens	35 eastern counties
1974	Oct. 20-Nov. 24	3 cocks	6 cocks	Statewide, except closed areas

APPENDIX III

Appendix III. **Game farm production of pheasants in Montana, 1930-73.**

Year	Warm Springs Game Farm	Billings Game Farm	Fort Peck Game Farm	Total
1930	6,146			6,146
1931	8,720			8,720
1932	4,856			4,856
1933	10,162			10,162
1934	9,970			9,970
1935	9,275			9,275
1936	10,572			10,572
1937	11,035			11,035
1938	10,759	4,797		15,556
1939	14,326	8,792		23,118
1940	15,653	12,080		27,733
1941	15,298	14,310		29,608
1942	13,466	15,309	8,070	36,845
1943			9,685	9,685
1944			20,869	20,869
1945	1,594	5,241	1,200	8,035
1946	6,017	14,865	16,137	37,019
1947	10,846	19,075	16,592	46,513
1948	13,357	14,329	10,510	38,196
1949	6,175	11,402	10,166	27,743
1950	7,196	12,781	10,751	30,728
1951	8,073	12,328	12,393	32,794
1952	10,150	11,768	11,805	33,723
1953	5,503	10,081	10,091	25,675
1954	13,041	11,905	11,587	36,533
1955	11,458	11,492	14,064	37,014
1956	12,007	10,383	11,269	33,659
1957	12,329	11,730	11,385	35,444
1958	13,132	6,109	12,162	31,403
1959	11,979		12,760	24,739
1960	7,214		713	7,927
1961	7,042			7,042
1962	6,138		2,447	8,585
1963	9,249			9,249
1964	7,559			7,559
1965	8,536			8,536
1966	8,300			8,300
1967	8,610			8,610
1968	8,087			8,087
1969	8,674			8,674
1970	7,707			7,707
1971	8,824			8,824
1972	9,930			9,930
1973	8,227			8,227
Totals	397,192	218,777	214,656	830,625